January, 1950

MODERN Machine Shop

Send FOR THIS CATALOG

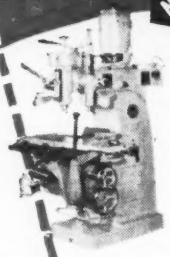
It will acquaint you with the complete line of GORTON TRACER-CONTROLLED MACHINE TOOLS and Accessories

Send for your copy today. Gorton tracer-controlled milling embodies distinct advantages on the production line and in the tool room. In many cases, special tooling will make a given operation entirely automatic. Send for the Gorton Condensed Catalog illustrated above or for any of the other specialized bulletins described below — they were published for your information and reference.

NEW

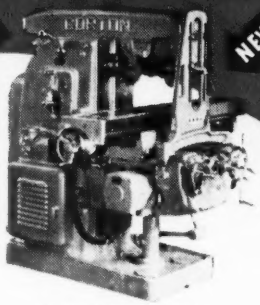
0-16A VERTICAL
Incorporates all of the desirable features of former 8-D. Also available with swivel or universal head. Bulletin 2240.

NEW



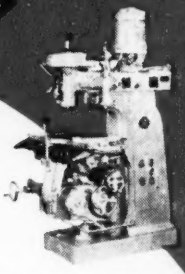
0-16A DUPLICATOR
Rugged, versatile and extra sensitive for exacting die and mold work. Also available with swivel or universal head. Bulletin 1319.

NEW

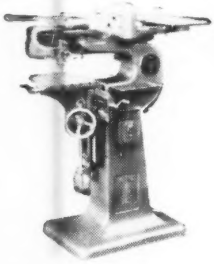


2-28B HORIZONTAL
No. 2 size, fullwidth plain type mill with 10 H.P. spindle drive and speeds up to 2,000 r.p.m. Built for maximum rigidity and a work horse load. Bulletin 2321.

NEW

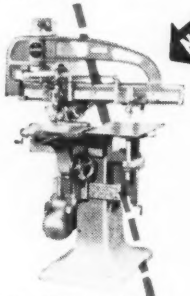


9-J DUPLICATOR
Rugged in construction; has "Gorton super-speed spindle and sensitive controls for the most exacting work. Bulletin 1319.

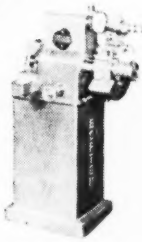


3-U PANTOGRAPH
Sturdy and rigid with sensitive tracer control. Larger and heavier 3-Z model also available. Bulletin 1580

NEW



P13 PANTOGRAPH
†Ratiobar Pantograph for 3-dimensional work. First basic design improvement in pantograph construction. Bulletin 2310.



375-2 CUTTER GRINDER
Universal type; bench or floor models; capacity up to ⅝" dia., including ball nose and multi-flute cutters. Bulletin 1317.

16-B AUTOMATIC LATHE
For precision turning of long slender parts from .005" dia., by 1/32" long to ⅞" dia., by 2¾" long. Bulletin 1800.

*Trade Mark Reg. U. S. Pat. Office

†Pats. Applied For

GEORGE GORTON MACHINE CO.

1701 Racine Street, Racine, Wisconsin, U.S.A.

Please Send at Once

For brief facts about the Gorton line of tracer-controlled machines, use coupon or company letterhead and request Bulletin 1655 illustrated above. For specific information on certain machines, see text accompanying each illustration.

Name.....

Title.....

Address.....State.....

Dept. 1701

VOLUME 22 NUMBER 8
JANUARY, 1950

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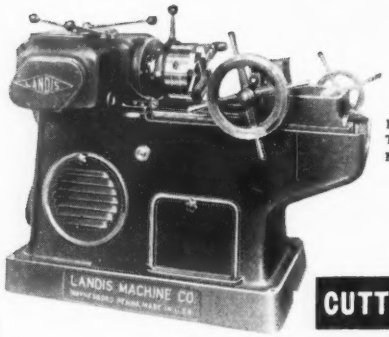
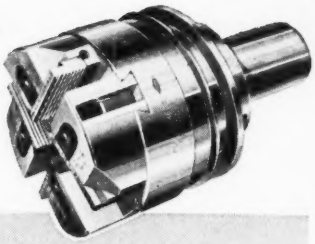
Printed in U. S. A.

MODERN Machine Shop Contents



LANDMACO
THREADING
MACHINES

LANDEX HEAD



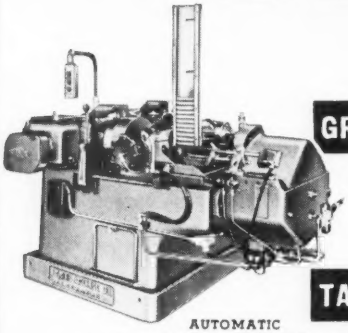
CUTTING

BETTER THREADS by LANDIS METHODS

GRINDING

● The LANDIS LINE, offering equipment designed to perform many types of threading operations, has a world-wide reputation for precision accuracy and high-speed production.

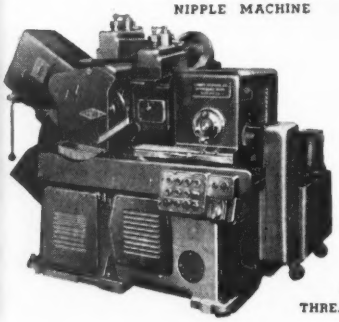
TAPPING



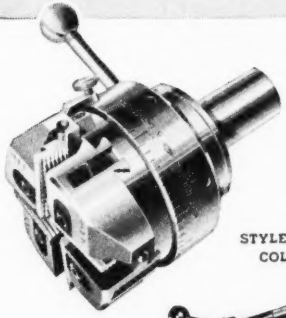
AUTOMATIC
NIPPLE MACHINE

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA.

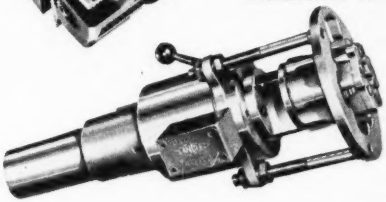


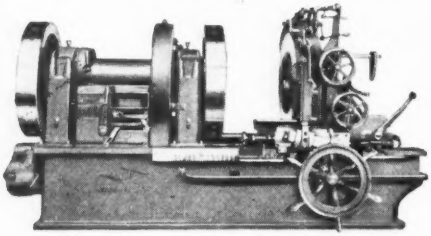
CENTERLESS
THREAD GRINDER



LANDMATIC
HEAD

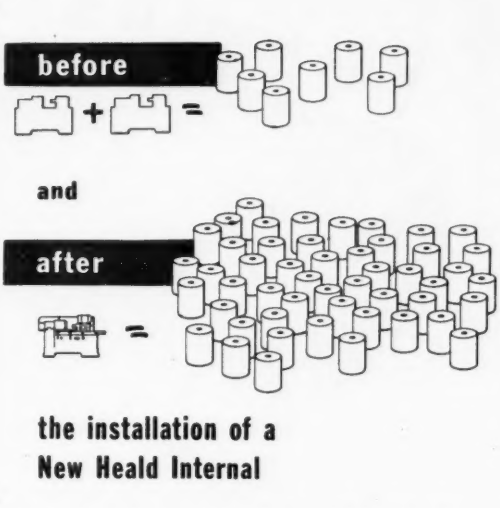
STYLE LL RECEDING
COLLAPSIBLE TAP





PIPE THREADING & CUTTING-OFF MACHINES

one hour's grinding production



the installation of a New Heald Internal

In case you didn't count them, there are *fifty* cam rollers in the "after" picture—compared to eight "before." That's how much difference a New Heald Model 271 Size-Matic Internal Grinder was able to make in the production picture of a textile machinery manufacturer. Before this Heald machine went on the job, these cam rollers were finished on two older type grinders. Now one Model 271 turns out more than six times as many parts per hour!

This machine grinds a variety of textile cam rollers, to a tolerance of .0005" for size. In the case of one part, with a long bore, a damped quill is used to help eliminate the possibility of chatter and resultant unsatisfactory finish.

This is a typical example of how Heald engineering can help to step up production schedules and cut the cost of precision finishing operations.

These five different types of textile cam rollers are internally ground faster, and with greater precision, on the Heald Model 271 Size-Matic shown above.

HEALD

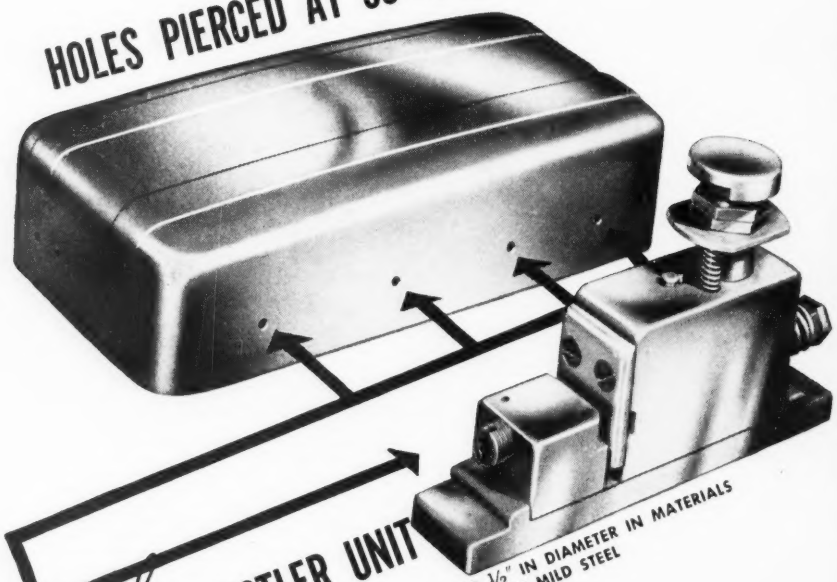
PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY
Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit
Indianapolis • Lansing • New York

HOLES PIERCED AT 90° ANGLE...

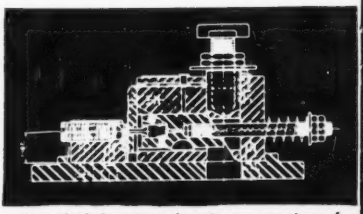


with NEW WHISTLER UNIT

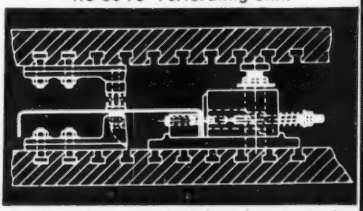
PERFORATES HOLES UP TO 1/2" IN DIAMETER IN MATERIALS TO 1/16" THICK MILD STEEL

Extruded shapes, ells, angles and other molded, shaped or fabricated pieces are easily pierced from the side at 90° with HU-50 Perforating Units. Quickly set up and adjustable, these units may be used separately or with standard perforating equipment. The advantages provided by other Whistler Adjustable Dies are retained. Absolute accuracy is assured. Quick change-over of hole arrangements can be made... in many cases, on the press. Production economies and speeded up operating schedules are effected. Continued re-use of units in different groupings spreads initial cost. It makes sense to look into the use of Whistler Adjustable Dies for all perforating, notching, slitting or rounding operations.

First Public Showing of Whistler Magnetic Dies at Work—Booth 832—ASTE Convention—April 10-14—Philadelphia



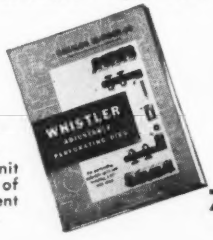
Detailed drawing showing operation of HU-50 90° Perforating Unit.



Typical set-up shows 90° perforating unit operated in conjunction with standard perforating equipment.

DETAILS EXPLAINED IN CATALOG NO. 48

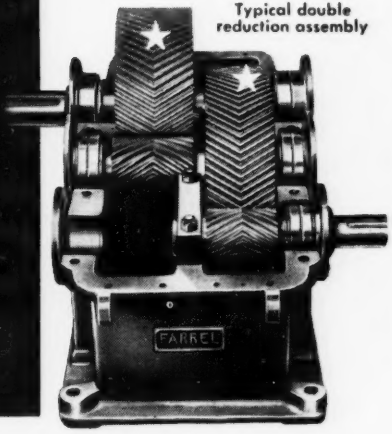
Get the facts about this 90° perforating unit in a hurry. Your copy of this catalog will be sent at once upon request.



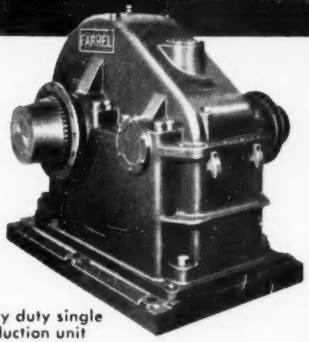
S. B. WHISTLER & SONS, Inc.

740 Military Road • Buffalo 17, N.

SINGLE AND DOUBLE REDUCTION GEAR UNITS *with a* BACKBONE*



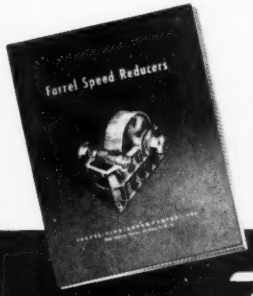
Typical double reduction assembly



Heavy duty single reduction unit

Farrel speed reducers have recently been completely re-engineered, and the line has been expanded to give a wider range of sizes and capacities. Ratios of single reduction units range from 1½:1 to 10:1; double reduction units from 10:1 to 60:1; triple reduction units from 82 to 318.

All of these reducers are equipped with Farrel - Sykes continuous - tooth, herringbone gears—the famous *Gear with a Backbone*—which provide extra strength and high load-carrying capacity. Because they are generated with a high degree of precision, these gears are extremely quiet in operation and give many years of trouble-free service.



For the full story of the many features of Farrel speed reducers, send for a copy of new Bulletin 449.

FARREL-BIRMINGHAM COMPANY, INC.
344 VULCAN STREET, BUFFALO 7, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Los Angeles, Tulsa, Houston

FB-549

Farrel-Birmingham

THE "LEADER" ON *Finishing* TAPS

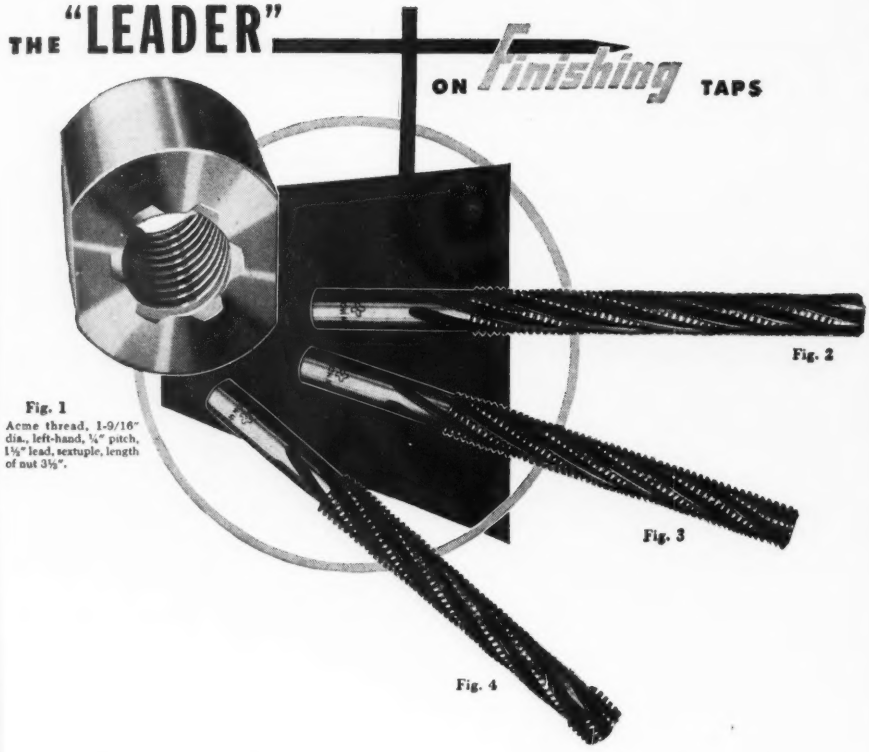


Fig. 1
Acme thread, 1-9/16" dia., left-hand, ¼" pitch, 1½" lead, sextuple, length of nut 3½".

Fig. 2

Fig. 3

Fig. 4

NO... this is not a self-applied pat on our own backs. Here's the story... and the pictures.

FIG. 1... shows a difficult tapping operation successfully performed with a set of 3 H-W "Finished Taps"... (finished after hardening).

FIG'S. 2-3-4... show the two reasons for the successful job... one, the spiral flutes at right angle to the thread, which give correct cutting action to both sides of the teeth... two, the "Leader" sections on taps (Fig's. 3-4), which correctly engage the thread cut by the first tap (Fig. 2), and follow exactly the same accurate path. This thread had to be chased until Hanson Process taps were used. The economy of "Finished Taps" is therefore evident... as are the design and accuracy of H-W taps.

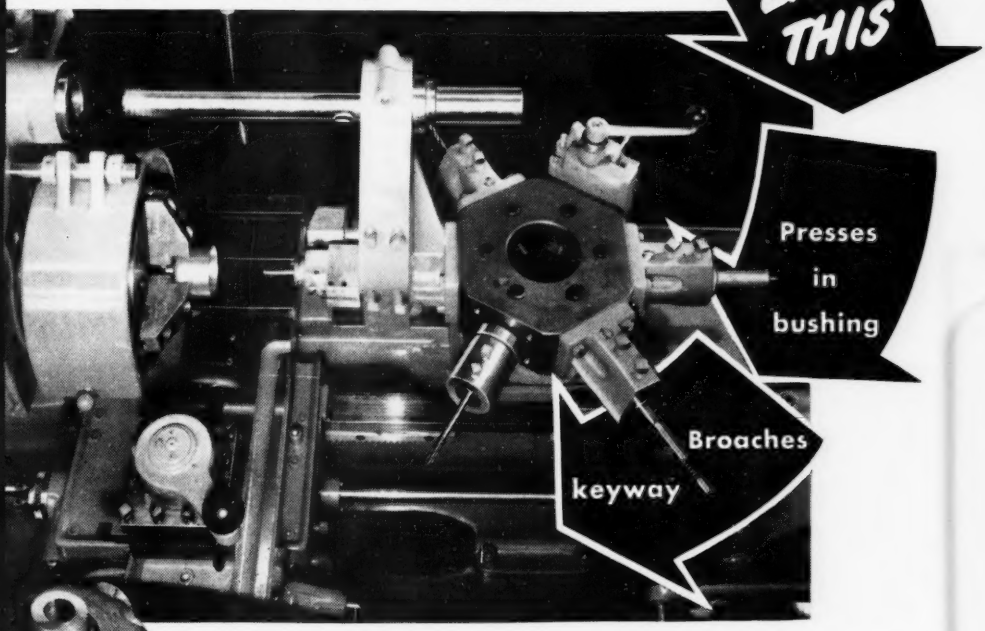
HANSON-WHITNEY MACHINE CO., HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

Valuable engineering, illustrated catalog on request. Please use your business stationery.

Hanson Whitney
PIONEERS OF FINISHED TAPS

hw90

Turret Lathe Ideas—



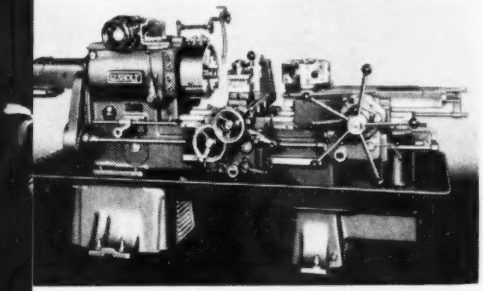
Save you time and money... INCREASE PRODUCTION!

Darned clever, these production men!

Note the use of this Gisholt No. 3 Ram Type Turret Lathe. In addition to handling all the typical drilling, boring, facing and reaming operations on the inside of a small motor housing, this turret lathe is used to:

Broach the keyway
Press in a bushing
Finish machine in place

olt No. 3 Universal Ram Type Turret Lathe



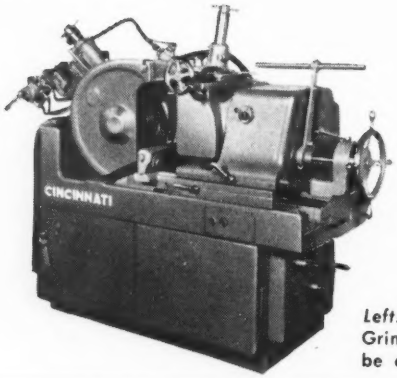
The entire operation on these parts takes only 1.37 minutes. Figure the time and cost saved in not having to transfer parts to other machines—or other departments—for these operations.

Don't overlook the many ways you can get greater production from your turret lathes. Gisholt engineers have all kinds of money-saving ideas to help you with your problems. Ask one to call. Or write us.

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

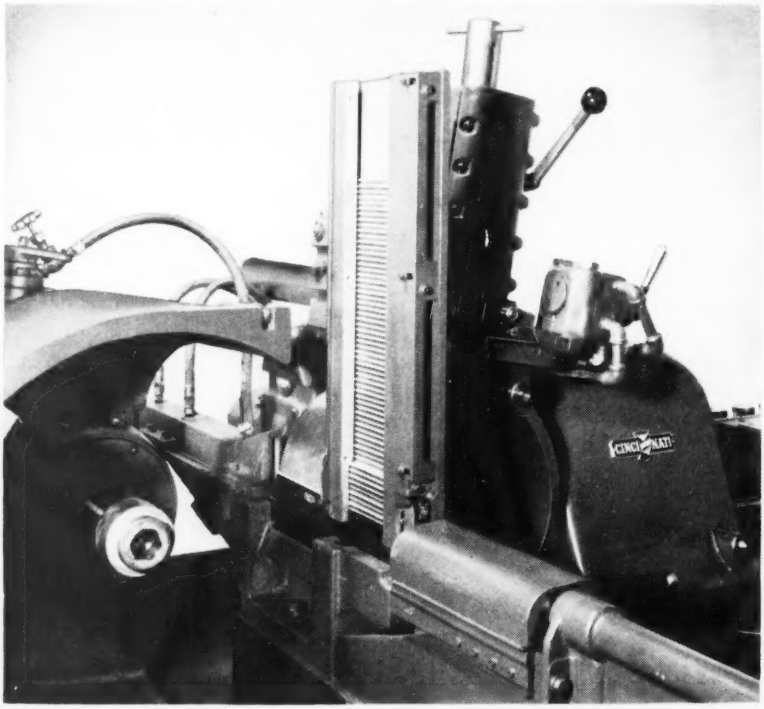
GISHOLT MACHINE COMPANY
Madison 10, Wis.

ET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Going PRECISION

Left: CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Complete details may be obtained by writing for catalog G-591.



Close-up of loading device, mounted on CINCINNATI FILMATIC No. 2 Centerless, developed by Cincinnati Application Engineers to grind the entire length of armature shafts. The grinding wheel has been removed to show the equipment to better advantage.

Down . . .

GRINDING COSTS

FILMATIC

ON LOWER LEVEL

Precision grinding costs always go down when Cincinnati Application Engineers take over. In this example, they have developed equipment for automatically grinding armature shafts at a high rate of production. ¶ A hydraulically operated magazine type loading fixture automatically lowers the parts to work rest height. Positioning, grinding to size, and ejecting is accomplished with a hydraulic automatic infeed attachment, synchronized with a work positioning and ejecting device. Both wheels are equipped with a new type of precision profile truing device having antifriction bearing slides.

CINCINNATI APPLICATION ENGINEERS

want a chance to show you what can be done to reduce the cost of your precision grinding operations. Send us a resumé of your problems, or ask for one of our fieldmen to visit you.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

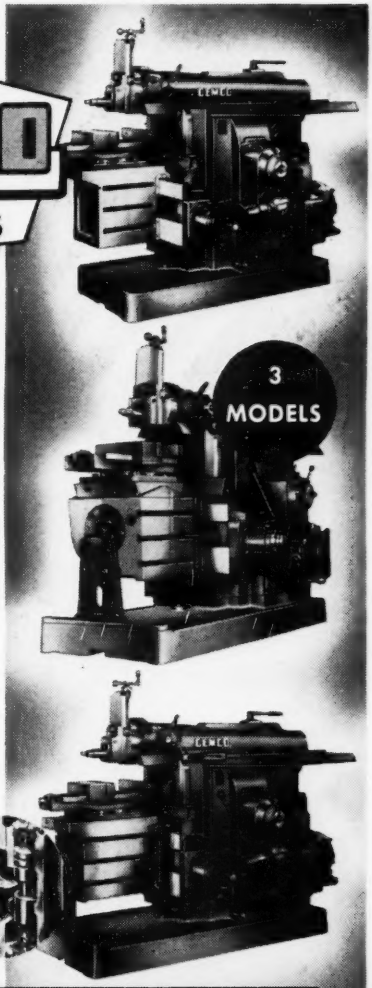
Beat Costly Obsolescence

with Shapers MATCHED FOR THE JOB

MODERNIZE

with GEMCO

PRECISION SHAPERS



. . *to* CUT PRODUCTION COSTS *and* INCREASE PROFITS

GEMCO Shapers provide a 3-way efficiency... ruggedness, precision, adaptability. In 3 models... for average machine shop work (PLAIN); for heavy production work (PRODUCTION); for tool and die work, etc. (UNIVERSAL). IN SIZES FROM 16" TO 36" INCL.

In these New Model Universal Shapers, GEMCO engineers have incorporated new, additional features...

1. Built-in horizontal and vertical Power Rapid Traverse.
2. Built-in horizontal and vertical Selective Feed.
3. All controls unilaterally located for Ease in Operation.
4. Twin Bull-Gear Drive for longer operating life.
5. Superior design enabling quick, easy Servicing when necessary.

THEY'RE LUBRIGARD PROTECTED

WRITE FOR BULLETIN GC-135

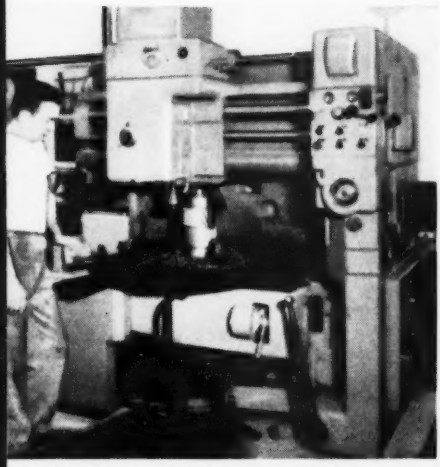
GENERAL ENGINEERING & MFG. CO.

MANUFACTURERS OF PRECISION MACHINERY SINCE 1917

4417 OLEATHA AVE. • ST. LOUIS 16, MO.


GEARS...without
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

Growl... FOR MARINE PROPULSION



The Fellows No. 36 Gear Shaper installed for cutting production-run quantities of speed reduction and reverse gears at Snow and Nabstedt Gear Corp., New Haven, Conn.

The massive rigidity of this big No. 36 Gear Shaper opens up broad avenues of time saving in the cutting of heavy-duty precision gears with helical, spur or herringbone teeth... Power to hog out stock and precision to hold finish cuts to "tenths"... Speed and feed changes made in seconds... Well worth investigating! Complete literature on request.

ROUGHING AND PRE-SHAVING PERFORMANCE

at Snow & Nabstedt Gear Corp., New Haven, Conn. — manufacturers of S-N Marine Reverse and Reduction Gears.

•

WORK: 57-tooth Herringbone Gear, 14.250 inches P.D.... and 25-tooth Mating Pinion, 6.250 inches P.D. (both SAE 8620 steel)

TOOTH CHARACTERISTICS:

Diametral Pitch	4/5
Pressure Angle	20 degrees
Helix Angle	23 degrees
Face Width	3.375 inches
Whole Tooth Depth	.475 inches

GEAR SHAPER SETTING:

Strokes per minute	86
Feed per stroke	.0225 inches

ROUGHING TIME:

(Material Normalized Prior to Cutting)

Gear (in one cut)	26.5 minutes
Pinion (in one cut)	13.5 minutes

PRE-SHAVING:

(After Carburization)

Gear (in one cut)	23.5 minutes
Pinion (in one cut)	10.5 minutes

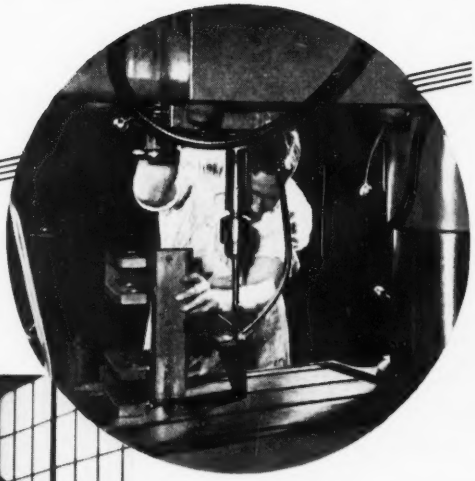
SAME GEARS SHAVED ON FELLOWS SHAVING MACHINES
with minimum stock removal, minimum correction needed.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.

FOSDICK
Sensitive
RADIALS

for greater efficiency on more operations!



Illustrating an interesting job being drilled on a FOSDICK Sensitive RADIAL at the plant of Benjamin E. Jarvis, Newark, N. J.

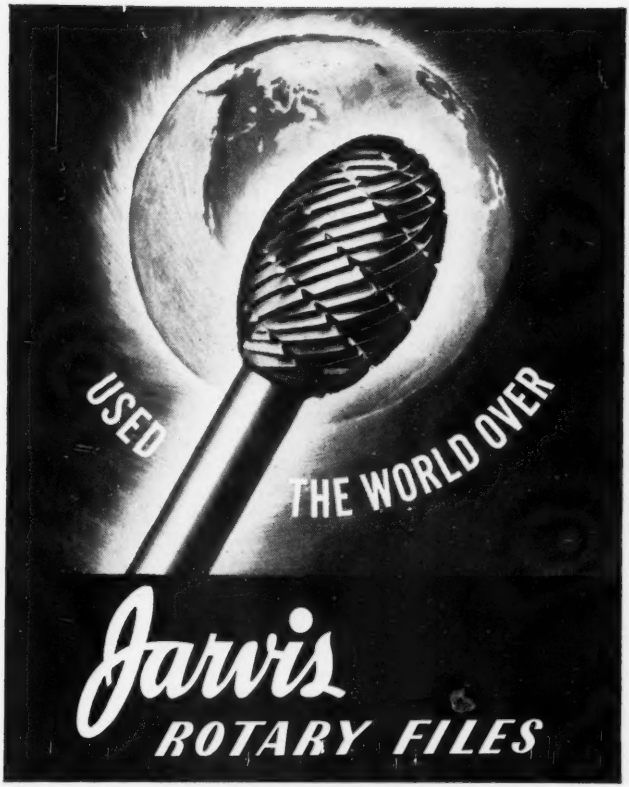
● One of the outstanding advantages of this new FOSDICK Sensitive RADIAL is the big increase in range of sensitive operations it can handle—easily—quickly—economically.

The one piece column provides additional strength and rigidity. The adjustable table which can be moved either by power or hand assures work in correct position for the job at hand. The flexibility of the table and arm, both of which swing in an arc of 360° on the column, permits a wide range of work to be handled and the arm at fixed height assures ease of operation on all jobs.

The machines are available in 3 and 4 foot sizes. There are nine spindle speeds and four feeds and both speeds and feeds are controlled by direct reading levers on the head.

For complete details write for the Fosdick Sensitive Radial Bulletin, S.R.M.M.S.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO



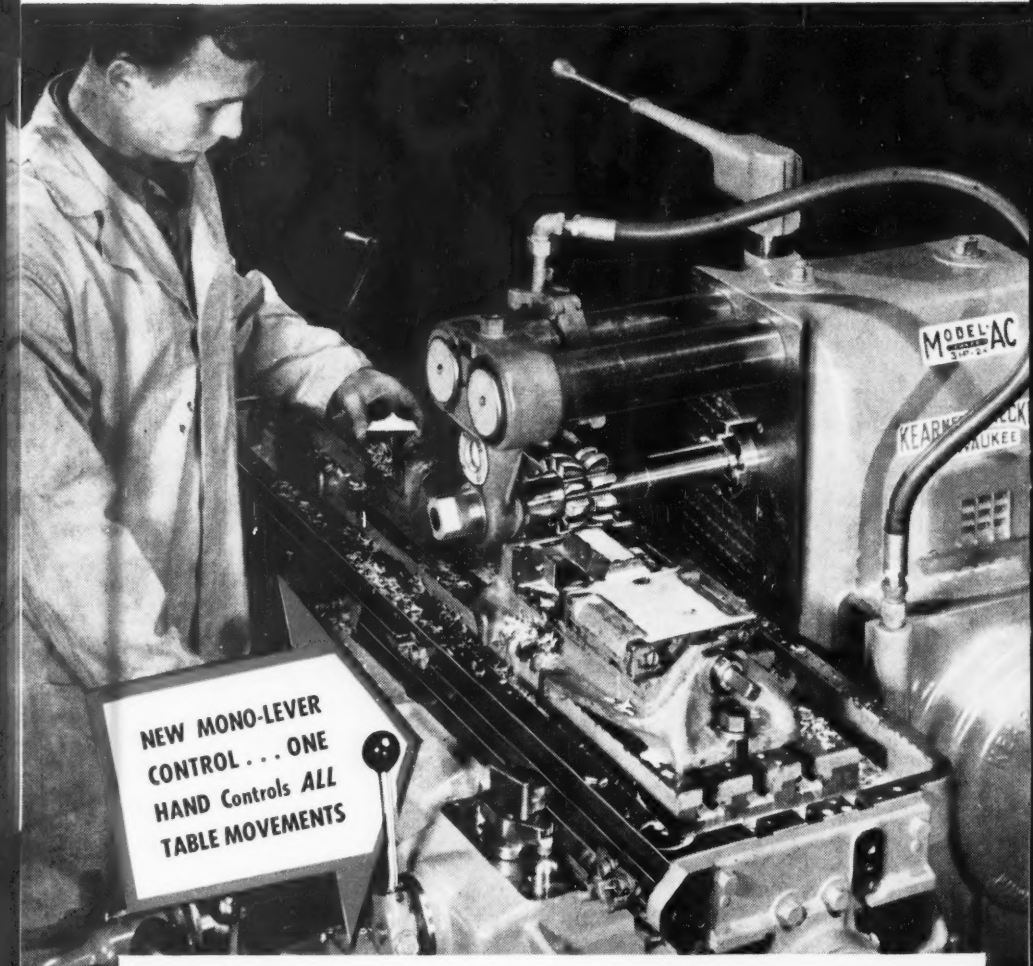
Particular Craftsmen the world over depend on Jarvis Rotary Files to do their most precise filing. Equally effective on steel or bronze, magnesium or aluminum, plastic or wood composition, many-shaped Jarvis Rotary Files come with coarse, standard, fine, super-fine, diamond or herringbone flutings — specials for special jobs. Rigid quality control and most advanced production methods make these ground-from-the-solid files better than ever before. Used with Jarvis Flexible Shaft Machines, they make a perfect combination for dependable, quality production. For free literature write to The Charles L. Jarvis Company, Middletown, Connecticut.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Now in the 3hp range..FOUR NEW MACHINES FEATURING



Camera study of good management at work! The job — form mill two radii on medium steel wedge plates. Fine finish required. With new Kearney & Trecker 3 hp Model 24-AC machine, operator sets up automatic table cycle for reciprocal milling and easily paces production using climb and conventional milling alternately. RESULT: 28% savings in loading time, reduced scrap, more uniformity, less operator fatigue.

KNEE-TYPE MILLING MONO-LEVER CONTROL

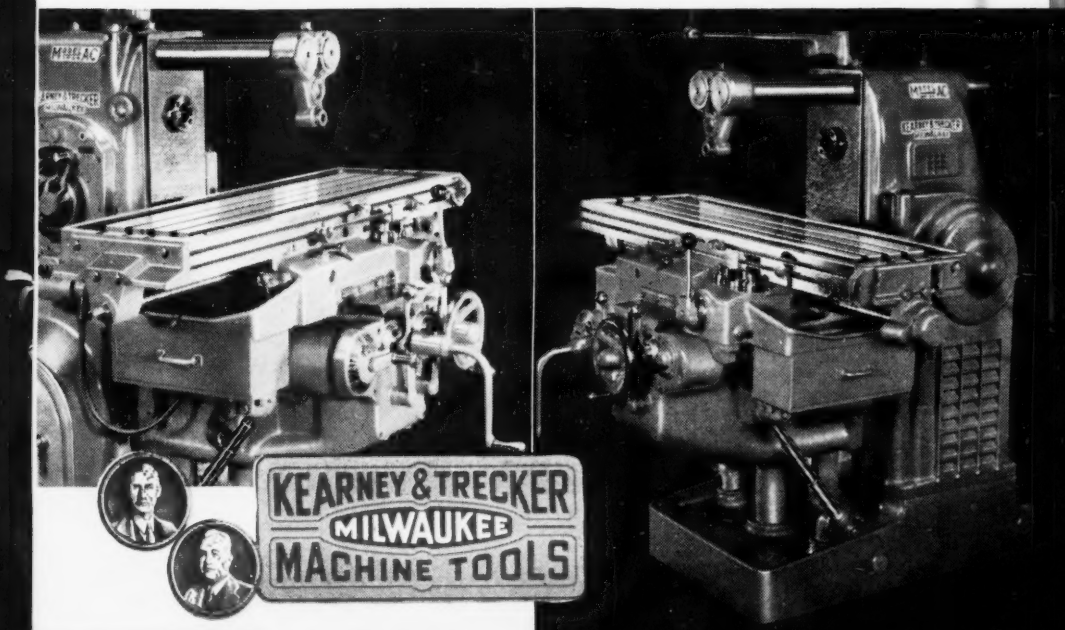
YOU asked for them — Kearney & Trecker milling machines in the 3 hp range with Mono-Lever Control and Automatic Table Cycle. Here they are — your choice of two different styles, plain or vertical with either 18″ or 24″ table feed.

These machines offer you features never before available on machines of this size and type: 33% larger table working area plus built-in deep-well coolant troughs all around — extra large (2″ dia.) precision-ground table screw with adjustable nut to eliminate backlash — drawer-type chip containers for easy chip removal — positive metered lubrication of the saddle and table ways and table feed mechanism — six-way power rapid traverse — automatic spindle stop — and quick-change feed and speed selection.

Don't wait. It costs you nothing to find out today about these new machines. See how they can meet all around big or small job requirements in your shop. For detailed information call our nearest representative or write direct to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis.

You get 33% more table working area on these new machines — 38″ x 14″ on Model 18-AC and 44″ x 14″ on Model 24-AC. This means greater adaptability to handle more jobs.

New 3 hp Model 24-AC plain style Kearney & Trecker milling machine featuring Mono-Lever Control and Automatic Table Cycle . . . ask about it or the vertical style equivalent today!



That's all it takes
to release a HORTON KEYLESS DRILL CHUCK

The Horton releaser is the secret! This ingenious device . . . exclusive with Horton . . . acts independently of the tightening screw, prevents binding and jamming, saves valuable time, extends chuck life.

Expert heat-treating, precision machining, and top-quality alloy steel guarantee maximum gripping power and accuracy within .003 indicator reading for full range.

Specify Horton Keyless Drill Chucks . . . with the exclusive Horton releaser and ball bearings . . . for longer wear and better service.

Also see our complete line of hand and power-operated lathe chucks.

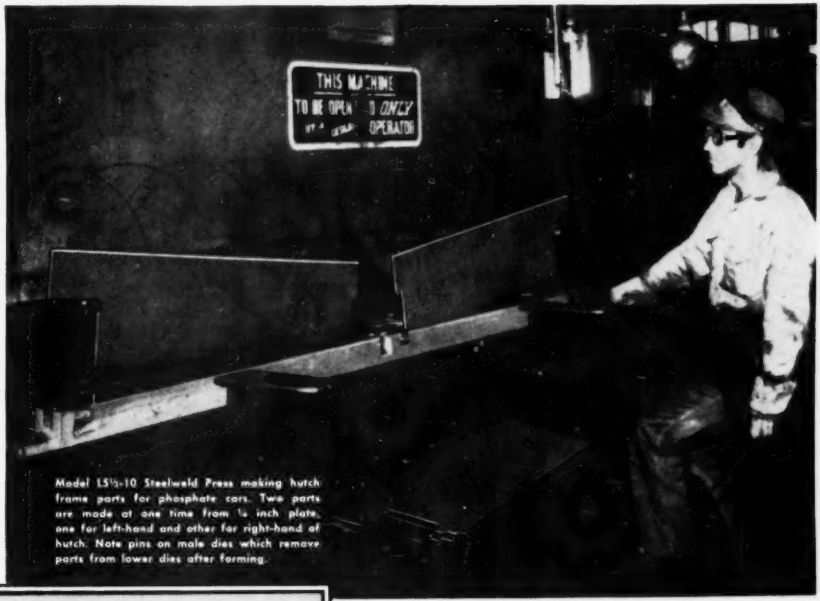
Call your local distributor, or write for new catalog sheets.

The E. HORTON & SON Co.

WINDSOR LOCKS • CONNECTICUT

HORTON Since 1851 CHUCKS

PULLMAN-STANDARD FINDS MANY USES FOR STEELWELD PRESS



Model LS½-10 Steelweld Press making hutch frame parts for phosphate cars. Two parts are made at one time from ¼ inch plate, one for left-hand and other for right-hand of hutch. Note pins on male dies which remove parts from lower dies after forming.

A few of the many parts produced within a short period on the Steelweld Press. Curves and bends of every shape and degree are formed quickly and accurately.

"The more we use our Steelweld Bending Press, the more we learn about what it can do for us", said the Day Superintendent of Pullman-Standard Car Mfg. Co., Butler, Penna. "As a result it is handling more and more of our work. We are doing a great many forming jobs on it that did not occur to us as being possible when we first installed the machine."

An endless variety of parts are produced on this press. These are mostly of ¼ and ⅜ inch steel plate and involve curves and bends of every description for gussets, fulcrums, braces, frames, housings, etc. used in the manufacture of railroad cars.

The dies used are relatively simple and made in the company's shop. Because dies are easily changed, it usually takes about an hour to set up for a new job.

If you work with metal plate in any thickness up to one inch, for bending, forming or punching, you should get the facts on the many features of Steelweld Presses.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

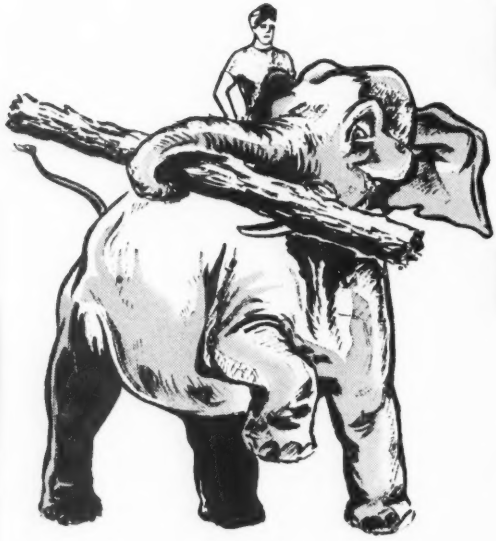
THE CLEVELAND CRANE & ENGINEERING CO.

6430 East 281st Street - Wickliffe, Ohio

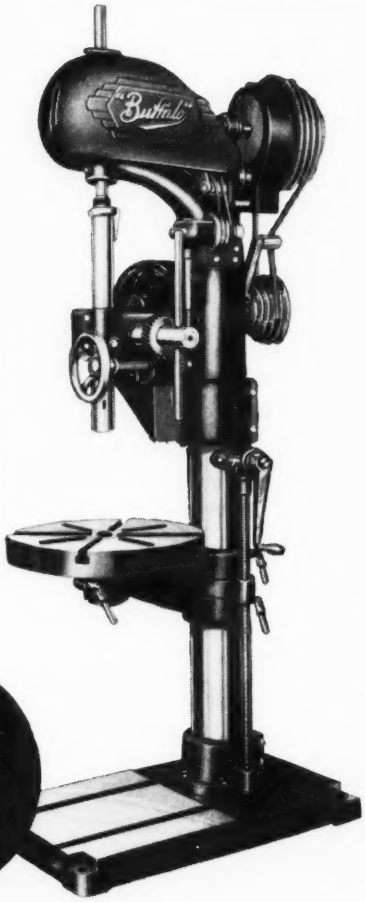
STEELWELD

BENDING PRESSES

BRAKING - FORMING - BLANKING - DRAWING - CORRUGATING - PUNCHING



POWER plus CONTROL



For Profitable HEAVY-DUTY DRILLING

"BUFFALO" No. 21 DRILLS are the answer to those "pressure" schedules you often have to meet in general shop work. Rugged and powerful, they're capable of continuous, heavy work up to 1½" in cast iron. And their controls allow operators to "eat up the work" easily and accurately. Eight quickly changed speeds—four convenient feeds—direct or back-geared drive—simple crank controls for fast setup changes—automatic depth control—make this possible. IT MEANS YEARS OF LOWER COST DRILLING! Why not get the facts on this popular "Buffalo" machine? Simply write for BULLETIN 3746.

BUFFALO FORGE COMPANY
388 Broadway
Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"
No. 21 DRILLS

New, Unique Simplicity!...

in custom-engineered

ELECTRONIC

INSPECTING

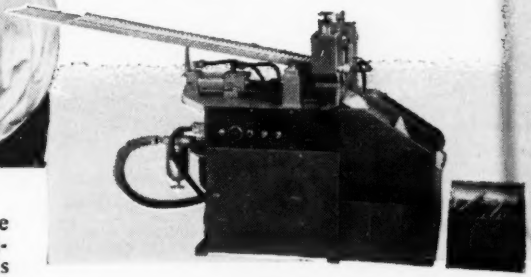
AND SORTING

EQUIPMENT

Through basic engineering developments, Brown & Sharpe is able to custom-build uniquely simple inspecting and sorting machines for precision parts. Machines of this description made by Brown & Sharpe have the advantages of simpler, sturdier construction; more stable adjustments; and easier manipulation of sensitivity.

Why not turn over your problem of getting machines like these to Brown & Sharpe? Learn what Brown & Sharpe can offer in custom-built inspecting and sorting machines, from manual loading and disposal to fully automatic. Send requirements outline to Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

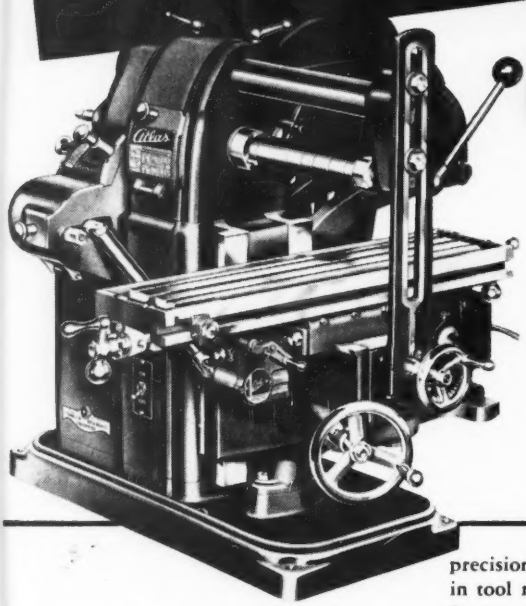
▲ This single-motor, compact machine automatically gages and sorts antifriction bearing rolls. It rejects rolls above or below mfg. tolerance and separates accepted rolls into 5 sized categories, in increments of .00002".



▲ This machine gages and sorts straight sleeves into four categories — measuring for length as well as diameter at both ends. Its production rate is approximately 3000 per hour.

BROWN & SHARPE BS

SLASH MILLING COSTS!



Atlas MILLING MACHINE

- ★ Timken bearings
- ★ Backgeared power
- ★ V-belt drive
- ★ 8 spindle speeds
- ★ 4½"x 18" precision-ground table

You can save hundreds of dollars a year with this Atlas miller on the job for small parts milling.

Its original cost is low — $315 for the Change-O-Matic machine, F.O.B., Kalamazoo, less arbor and motor. It will save many hours a month on set-ups — save on power and operating costs — and free your big machines for the jobs that only they can handle.

The Atlas handles the full range of milling from slabbing and facing cuts to end milling, keyways, finishings, and layout work. It is a precision machine in *every* respect—valuable in tool room or laboratory — ruggedly built for round-the-clock production. Adding air chucks gives you a semi-automatic producer at exceptionally low cost.

Send for new catalog — just off the press — with complete specifications and operating details.

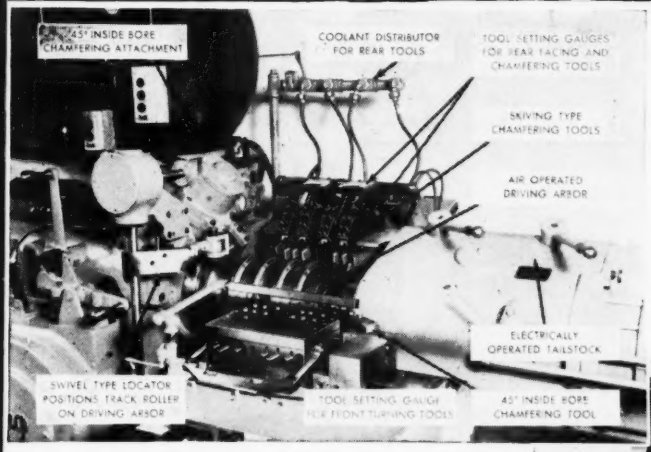
Atlas Press Co.
146 N. PITCHER STREET
KALAMAZOO, MICHIGAN

Atlas POWER KING

MATCHED PRECISION TOOLS FOR WOODWORKING AND METALWORKING

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



Close-up view of tooling.

Overall view of machine showing rough and finished work.

MODEL R-14 Lo-swing Lathe Cuts Machining Time on Track Rollers

Problem: **To automatically turn, face and chamfer Track Rollers in one operation.**

Solution: **The Model R-14 Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools. The Track Rollers, 9-3/4″ in diameter and 9-3/8″ long, are held and driven from the rough forged bore with a compensating type, six jaw air operated driver. The tailstock, shown in the withdrawn position in the lower illustration, is electrically operated and has a travel of 16″ to facilitate loading and unloading of the rollers on the driver. The upper illustration shows the tooling which consists of six front turning tools, eight heavy rear facing tools, eight small chamfering tools and two chamfering tools for the inside diameter. Note the special cam operated, 45° inside bore chamfering attachment mounted on the headstock of the lathe. Swivel type tool-setting gauges, mounted directly on the tool blocks, reduce tool-setting time. All tools are cemented tungsten carbide operating at cutting speed of 350 ft. per minute. Total floor to floor time for the job is 3.5 minutes each.**

Engineered jobs are our specialty, and our staff is at your disposal to assist in solving your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

Faster Tapping on every job...

WITH THIS COMPLETE

MORSE LINE

Yes, Morse Taps cut far faster because they're precision-cut themselves . . . give you smoother, stronger threads without clogging or damage. And that's because Morse takes the time and pains to make taps with a full measure of quality.

Whatever your material and job-conditions, Morse has the right tap for you . . . cut thread or ground thread . . . standard or special. Ask your Morse-Franchised Distributor to recommend the type and size of Morse Taps that will be most effective in speeding up your operation and cutting your costs. *Call him today.*

SPECIFY *Electrofized*
FOR LONGER LIFE

Sold Exclusively Through Morse-Franchised Distributors

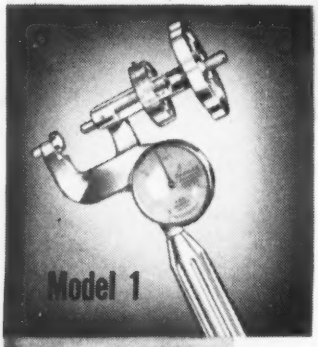
Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

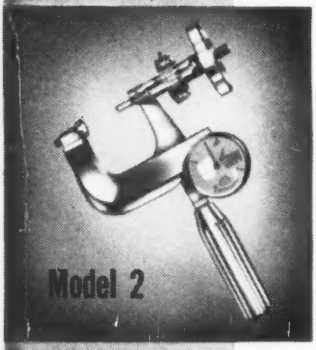
MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
A DIVISION OF VAN NORMAN COMPANY

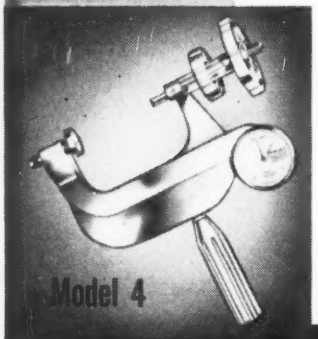
BRANCH WAREHOUSES: NEW YORK • DETROIT • CHICAGO • SAN FRANCISCO

Ames PRECISION HARDNESS TESTERS

FOR ROCKWELL HARDNESS TESTING







Today, hardness testing is a necessity in the working and fabrication of metals. Ames Portable Hardness Testers save an amazing amount of time by going to the work. No laboratory testing. No delays. No cutting off specimens. Anyone can get accurate readings directly in the Rockwell Hardness Scales easily and quickly.

Model 1 Hardness Tester

For testing round and flat stock, tubing, saws, knives, etc., up to one inch in Rockwell A, B and C Scales. Weighs only 1½ lbs.

Model 2 Hardness Tester

For testing rounds and flats, dies, odd-shaped pieces, etc., up to two inches in Rockwell A, B and C Scales. Two inch throat depth. Weighs 2½ lbs.

Model 4 Hardness Tester

For testing up to four inch capacity directly in Rockwell A, B and C Scales. Throat depth two inches. Taken to the work for accurate, on-the-spot tests. Weighs 3¼ lbs.

Send for descriptive literature.

AMES PRECISION MACHINE WORKS
WALTHAM 54, MASS.

A **BULLARD SPACER** applied to Radial Drills has proved its worth in Savings by eliminating many costly jigs previously required on many drilling operations.

Almost unbelievable operational Savings have also been made.

However, Accuracy is only as good as the accuracy of the Drill to which the Spacer is applied. To assure the Accuracy of which the spacer is capable, Cincinnati Bickford offer their Super Service Precision Drilling Machine.

With a Precision Spindle in the drill, this combination is *Hard to beat* on reproduced Accuracy of hole spacing, drilling, reaming and tapping.

Installations of this type are proving Profitable investments in numerous plants. Ask Bullard or Cincinnati Bickford about this "Natural" combination.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Cast Iron machining dust giving you trouble?

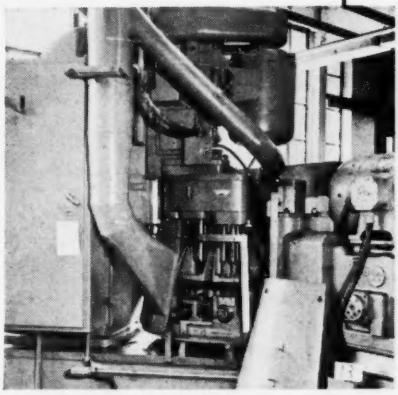
IF SO YOU'VE GOT A JOB FOR ROTO-CLONE DUST CONTROL

CAST iron dust has long presented a collection problem. Now, with increased machine tool speeds and the tendency to concentrate a greater number of operations in a given area, there is an ever-increasing demand for a practical solution.

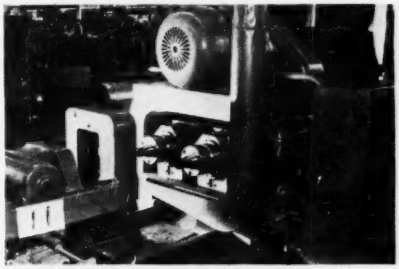
And here's the answer. Scores of companies are using Type D Roto-Clones* successfully to exhaust and collect fine, floating cast iron dust from their machining operations. Whether it's drilling, reaming, boring, milling, turning or gear cutting, you are assured of positive dust control.

The Type D Roto-Clone is the most widely used dust collector in industry today. Its advantages are many — constant efficiency under all operating conditions, uniform air volume, small space requirements and ease of installation. When desired, a Cycoil Oil Bath After-Cleaner can be added which will provide the necessary cleanliness to permit recirculation of the cleaned air to the workroom.

For complete information on the application of the Type D Roto-Clone to cast iron machining operations, call your local AAF representative or write direct to—



Roto-Clone Dust Control applied to Rehnberg-Jacobson Automatic which mills, drills, counterbores and reams.



Ex-Cello Boring Machine equipped with Roto-Clone Dust Control.

AMERICAN AIR FILTER COMPANY, INC.

100 Central Avenue, Louisville 8, Ky.

In Canada: Darling Bros., Ltd., Montreal, P. Q.

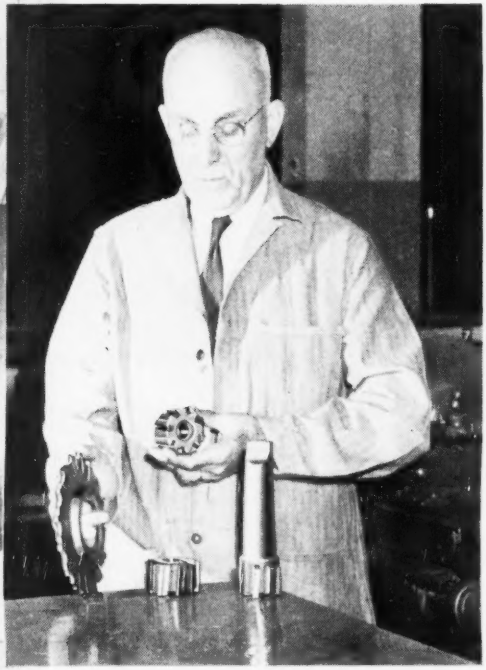
AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trademark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

INGERSOLL

SMALL DIAMETER AND NARROW
INSERTED BLADE CUTTERS



● This group of Small Diameter and Narrow Inserted Blade Cutters are used in our own shop. They are typical of this class of milling cutters. While they are more expensive initially than solid cutters, they are money savers in the long run.

● The Ingersoll Solid Shank End Mill at the right, for example, costs $35.00, while a solid cutter of the same dimensions sells for about $19.00. Since each set of HSS replacement blades for the Ingersoll cutter costs only $4.40, your cutter body investment is almost repaid with your first set of replacement blades. After that, you save about $14.60 with every set — the difference between the cost of blades and the price of a new solid cutter.

● The Ingersoll Staggered Tooth Slotting Cutter at the left costs about $34.00 more than a solid cutter of the same size, but this additional investment is returned to you with the first set of replacement blades. Starting with the second set of blades, you save about $35.00 every time you change.

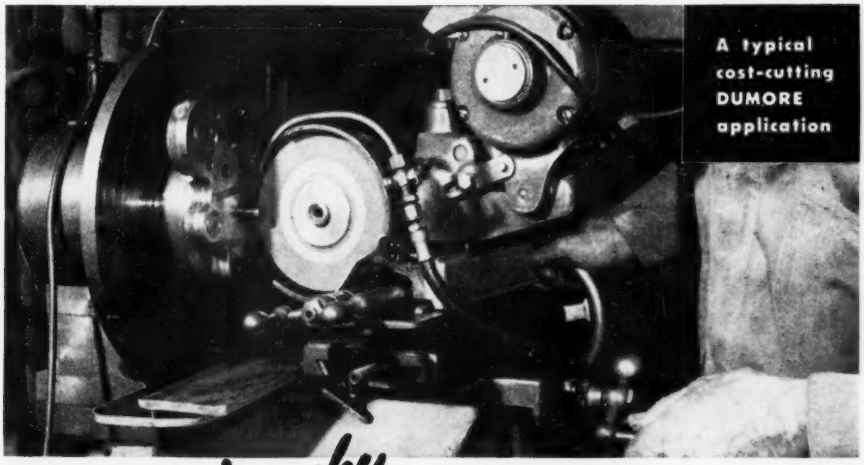
● The Ingersoll Face Mill in the operator's hand costs $34.00 compared to about $15.00 for a solid cutter of the same size, but you will break even with the third set of blades, and save nearly $7.00 with every change after that.

● Ingersoll Small Diameter and Narrow Inserted Blade Cutters are available in High Speed Steel or Carbide Tipped Blades.

● For specific information as to how much you can save by using Ingersoll Small Diameter and Narrow Inserted Blade Cutters, write us, giving the details of your milling and boring operation. If you wish, our representatives will call at your shop to study your operation and recommend cutters for your work.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS


If it's a Valve—
ROSS has it!
From: ENGINEERING DEPARTMENT
To
Ross has a lot of new valves. Better check with a Ross Engineer to be sure we're using the best models.
ROSS Air Control VALVES
For your files, write us for the name and address of your nearest Ross application engineer.
ROSS OPERATING VALVE COMPANY
120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN



Here's why L. K. Willis says... "We're DUMORE BOOSTERS!"

2 Dumore Grinders do work of $16,000 worth of special machinery

Willis Refrigeration Service, Long Beach, California, solves the common small-shop problem of handling a wide range of jobs with minimum machine investment by extensive use of Dumore Precision Grinders. Two typical set-ups, utilize a second-hand tap grinder, and (believe it or not) an old meat slicer, cost approximately $900 . . . eliminate $16,000 worth of special machinery, save over $15,000.

6 operations on 1 part cost less than $1.00 including labor

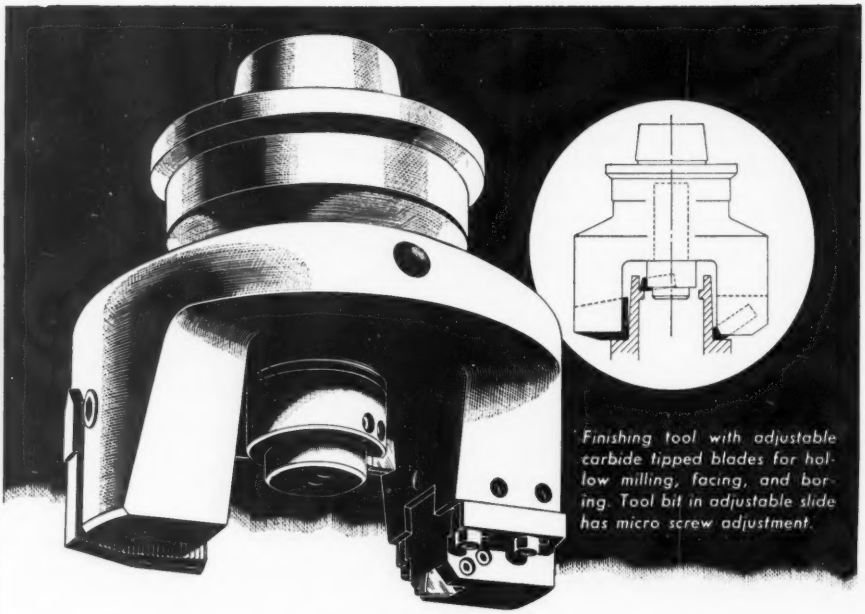
Using a Series 5 Grinder on a used screw-machine base, Willis performs six operations on a pump for less than $1.00 including labor — (1) grind indexing position on cylinder block, (2) grind valve pads, (3) grind valve seats, (4) grind indexing position on valve plate, (5) grind valve plate surface, (6) grind hardened steel disc of discharge valve. They have owned the Series 11 six years, and the Series 5 three years. Willis says, "no maintenance of any consequence . . . work with always-dependable accuracy".

Ask your DUMORE Distributor to show you how DUMORE Grinders can give you high production, .0001" accuracy at a lower tool investment. Call him today, or write The DUMORE COMPANY, Dept. A-33, Racine, Wisconsin.

DUMORE

DG-3

Export address:
The DUMORE COMPANY
13 East 40th St., New York 16, N.Y., U.S.A.



Finishing tool with adjustable carbide tipped blades for hollow milling, facing, and boring. Tool bit in adjustable slide has micro screw adjustment.

They cut the METAL . . . cut the COSTS

Alarming facts about obsolescence of machine tools have recently been published.

You may or may not be able to replace your obsolete machines. But in either case, remember it's the tools in those machines that cut the metal. They'll cut costs too . . . if efficiently designed. Quite often it's the tooling that makes the difference between profit and loss.

A striking example of how an existing machine was re-tooled for greater productivity is shown here. Designed and built by Gairing, it is one of ten multi-operation tools made to fit a two-way, four-spindle, roughing and precision boring machine making tractor parts.

The success of this well planned tool set-up resulted in an immediate order for more such up-to-the-minute tooling from the same client.

Gairing's representatives and tool engineers stand ready to see what can be done for you . . . to design and build for your *new* machines or for your *old* . . . the tools that cut the metal, cut the costs. The Gairing Tool Company, Box 478, Detroit 32, Michigan.

Also Manufacturers of:
STANDARD END CUTTING TOOLS
QUICK-CHANGE BLOCK-TYPE BORING TOOLS
E-CON-O-MILL STANDARD FACE MILLS
GAIR-LOCK FINE TOOTH CUTTERS

GAIRING TOOLS

14-1/2" x 5', 1" collet, Toolroom Lathe with 1-1/2 h. p., 3 phase, 60 cycle, 220 volt motor and switch; f. o. b. factory **$1466.25**

Time Payments—$367.25 down, $97.07 for 12 months.

Precision Tolerances Easy

Because it is easy to machine work to the most exacting specifications with South Bend Lathes, they were selected by one of the largest steel manufacturers for use in their research laboratory shown in the illustration above. Here special tools, dies, fixtures and parts are machined to specified dimensions with ease and certainty.

Often the accuracy and quality of finish obtained with South Bend Lathes are such that subsequent grinding, honing, or lapping operations are unnecessary. Equally adaptable to toolroom, manufacturing, or maintenance operations, South Bend Lathes will give you years of satisfactory service for a minimum cost.

Send for Information

Check Machine Tools You Are Interested In

- ☐ 14-1/2" PRECISION LATHES

- ☐ BENCH LATHES 9" and 10"
- ☐ TURRET LATHES 1/2" and 1" collets

- ☐ 7" SHAPER
- ☐ 14" DRILL PRESS
- ☐ 10", 13", 16", 16/24" PRECISION LATHES
- ☐ LATHE TOOLS AND ATTACHMENTS
- ☐ TIME PAYMENT PLAN

Name _____

Street _____

City _____ Zone _____

State _____

Building Better Tools Since 1906

SOUTH BEND LATHE

SOUTH BEND, INDIANA

Because of its Knurled Head...

...SCREWS IN FASTER AND FURTHER BEFORE A WRENCH BECOMES NECESSARY . . . .

UNBRAKO

KNURLED

SOCKET HEAD CAP SCREW

There is a definite saving of assembly time when you use "UNBRAKO" Socket Head Cap Screws with Knurled Heads. The exclusive Knurled Heads perform triple duty: (1) the *Knurling* provides a sure, slip-proof grip; (2) the *Knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in faster and further with the fingers—handiest of all wrenches—before a "key" becomes necessary; (3) the *Knurling* permits positive locking—a feature so often essential where there is excessive impact or vibration.

As always, the brand name "UNBRAKO" signifies *extra strength* and *precision manufacture to close tolerances*. "UNBRAKO" *Knurled* Socket Head Cap Screws are available in both National Coarse and National Fine Thread Series in a full range of standard sizes. Other sizes to special order. Write us for your free copy of the "UNBRAKO" Catalog and the name of your nearest "UNBRAKO" Distributor.

Knurling of Socket Screws originated with "Unbrako" in 1934.

Other "UNBRAKO" Products Include:

Socket Set Screws with Knurled Cup Points, Socket Set Screws with Knurled Threads, Square Head Set Screws with Knurled Cup Points—all patented Self-Locking screws that *won't shake loose!* Knurled Socket Head Stripper Bolts • Precision-Ground Dowel Pins • Fully-Formed Pressure Plugs.

SPS STANDARD PRESSED STEEL CO.

BOX 556, JENKINTOWN, PENNSYLVANIA

"UNBRAKO Counts with the Men who Count"

SAVE DOLLARS

IN YOUR TOOL ROOM

The OLIVER HEAVY DUTY ACE CUTTER GRINDER will *save you dollars* in your tool room operations.

This Oliver Machine is designed for heavy jobs . . . gashing, gumming and finish grinding High Speed Stellite and Tungsten-Carbide Cutters.

The ACE is most *versatile*. The range of cutting tools accommodated by this machine with a minimum of extra features is exceptional. It offers easy and quick set-up with less operator fatigue . . . work is in full view of operator. A fixed diamond compensates for wheel wear between teeth. In fact, the ACE Cutter Grinder gives you every feature possible to *expedite* your tool room operations.

A small model ACE Cutter Grinder for lighter work is available (illustrated at the right above).

WRITE FOR COMPLETE INFORMATION

OLIVER INSTRUMENT CO.

1430 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

15 NEW COST-CUTTERS

THE 15-IN-5 ROTOR CHIPPERS

5 "REGULARS"... 5 "SUPER-SPEEDS"... 5 "SUPER-SOCKS"
—ALL FROM 5 BASIC MODELS

Rotor Tool brings you the biggest step forward in chipping hammers in the past 15 years!

You can give Old Man Cost a blow he'll never forget with the sensational new ROTOR Chipping Hammers!

MORE VERSATILE. You can easily adapt each basic model to serve as *3 hammers to match your job.* (1) A "regular" model, (2) A "super-speed" model, (3) A "super-sock" model—because you can switch from one to another by a simple change of parts.

SHORTER *. . . easier to get into crowded quarters* because of new exclusive "doughnut" valve.

LIGHTER *. . . easier to handle.*

FASTER CUTTING *because of new exclusive design.*

Write for all the facts today!

AIR O'TOOL

Substitute 1 Machine for 3 or 4!

RAISE PRODUCTION and LOWER COSTS.

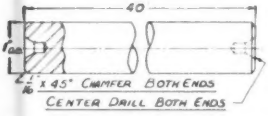
BY COMBINING OPERATIONS with the MOTCH & MERRYWEATHER "DE" (Double End) TRANSFER MACHINE

1 SAWS STOCK TO ACCURATE LENGTHS

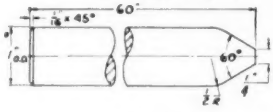
2 (1) Chamfers both ends. (2) Center drills both ends. (3) Center drills and chamfers both ends. (4) Threads both ends (to a reasonable length). (5) Trepans one or both ends. (6) Turns one or both ends (box tool). (7) Chamfers O.D. and I.D. of tubing. (8) Reams one end or both ends of tubing. (9) Chamfers O.D. and reams both ends of tubing.

MORE THAN A NEW MACHINE—ACTUALLY A NEW METHOD

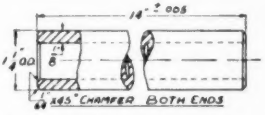
The Motch & Merryweather "DE" (double end) Transfer Machine has no equivalent. Standard bar stock is automatically fed, cut off with a square *milled finish* to accurate lengths, and automatically transferred to equalizing, self-centering jaws for accurate double-end machining. You save at least one operator; save several handlings; save overhead and floor space; save tooling. Husky construction makes for trouble-free service and long, profitable life. Illustrated below are six typical "transfer" jobs.



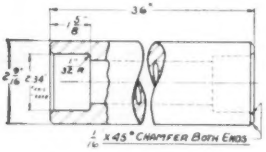
Operation: Cut off, chamfer and center drill both ends.
Material: SAE 1040 ground shafting.
Production: 240 pcs/hr.



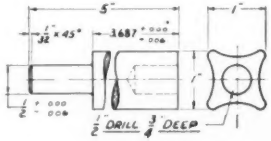
Operation: Cut off, chamfer one end, point opposite end.
Material: D SAE 1141 C. R.
Production: 163 pcs/hr.



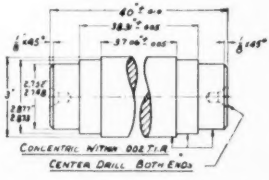
Operation Cut off and chamfer both ends
Material 1020 seamless tubing
Production 342 pcs/hr



Operation: Cut off, bore and chamfer inside and outside, both ends.
Material: SAE 1020 tubing.
Production: 180 pcs/hr.



Operation: Cut off, turn one end, drill opposite end
Material: Extruded brass.
Production: 200 pcs/hr.

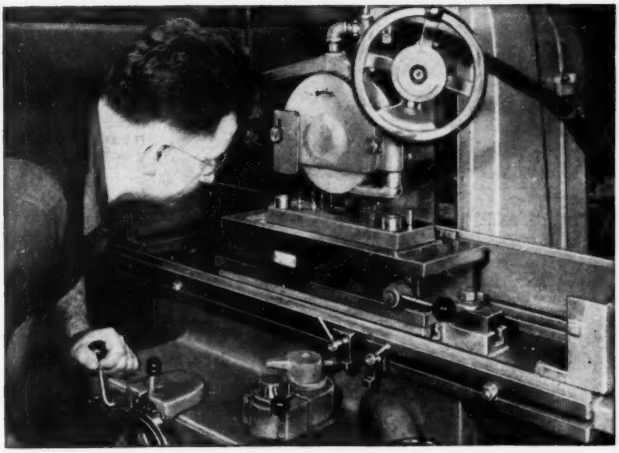


Operation Cut off, box mill, turn and center drill both ends.
Material: SAE 1020.
Production: 140 pcs/hr.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

Enthusiastic Customers do our BEST advertising



Tinnerman Products, Inc. of Cleveland, Ohio, manufacturers of Speed Nuts, use a No. 25 Grand Rapids Hydraulic Feed Surface Grinder in their toolroom. Here their Model 25 is shown grinding a combination die.

You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstandir.g features:

1. **One-piece column and base casting for vibrationless rigidity**
2. **Precision ball-bearing spindle which is greased for life**
3. **Bijur one-shot lubrication system eliminating hand oiling**
4. **Patented vertical movement of wheel head for quick, accurate adjustments**
5. **Portable coolant tank for ease of coolant replacement**
6. **Vane type hydraulic pump for fast longitudinal table travel**

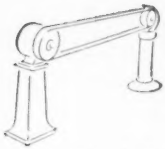
to serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

GRAND RAPIDS GRINDERS

GALLMEYER & LIVINGSTON COMPANY

308 Straight, S. W., Grand Rapids 4, Mich.



BACKSTAND-BELT GRINDING INCREASES PRODUCTION IN POLISHING AND FINISHING

The coated abrasive belt used in conjunction with contact wheel today is established as an efficient production tool. For grinding, polishing and finishing hundreds of consumer and industrial items, the backstand-belt method today has been proved much more efficient and economical than has the old set-up wheel method.

Five Advantages

Manufacturers who have switched from the set-up wheel method point to five distinct advantages of the backstand-belt method over the set-up wheel . . .

• An abrasive belt is a scientifically made tool, manufactured under controlled atmosphere conditions by experts utilizing modern making equipment. The photomicrographs compare the crude, uncontrollable rolled-on cutting surface of typical set-up wheel (A) with the coating on an Armour Abrasive Belt (B). Note how the sharp cutting points on the factory-coated belt are exposed to provide faster, cleaner cutting action—increased production.

A B

• The coated abrasive belt cuts cooler because of the longer interval between work contacts.

• Inexperienced help can be quickly trained to operate a backstand-belt machine. Skilled personnel needed to dress set-up wheels can be used elsewhere.

• It takes only a few seconds to change an abrasive belt.

• The temperature-controlled room used for curing set-up wheels can be released for other more productive uses.

Actual Case History

The W. L. and Metals Company used a hard, set-up polishing wheel on aluminum sand castings for aircraft and transportation industries. The wheels had to be inspected constantly for out-of roundness.

When the company changed to the backstand-belt method, removing gates and fins from castings was no longer a drawback to production. With this new method abrasive costs were lower and the finish much better. The entire operation was speeded up 50-60%.

It will pay you to investigate the modern backstand-belt method. Write today to the Coated Abrasives Division, Armour and Company, North Benton Road, Alliance, Ohio, for the booklet – "Facts about Backstand-Belt Grinding and Polishing."

"STEEL BARS?

Yes!

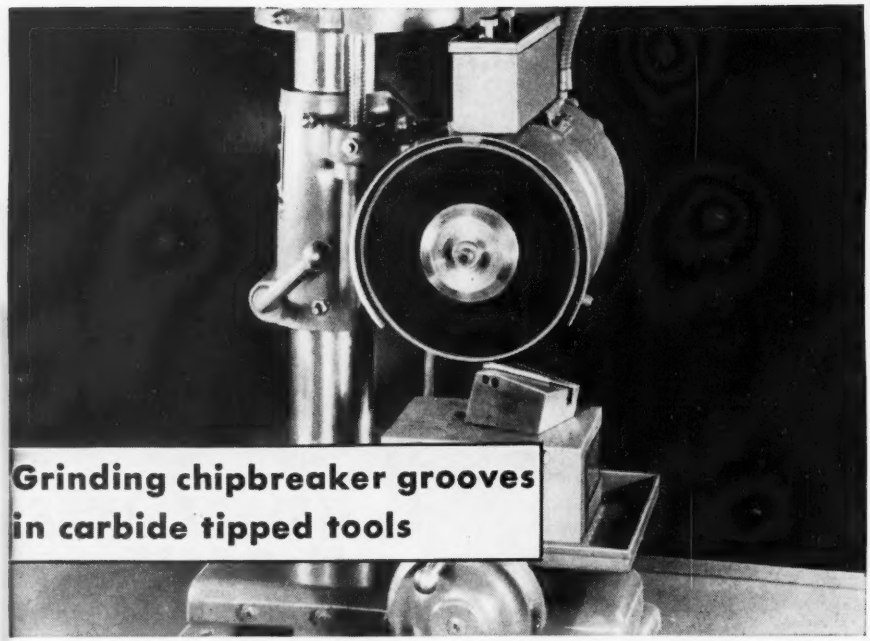
I'LL DELIVER AT ONCE"

IMMEDIATE DELIVERY is a "must" for the Union Drawn Distributor—the shapes and sizes wanted—a bar at a time or a truckload. Why? • Because his stock acts as production *supply line* for many a successful plant and shop in your area—and his failure would be their failure. • Because of volume, turnover, diversification and control . . . gaps just don't happen in HIS stockpile. • In addition to unfreezing your dollars buried in your own stock, you reduce "down-time" to a minimum when you hitch your production line to his stockpile. • Ask for his stocklist and get under way today!

PHONE YOUR UNION DRAWN DISTRIBUTOR *Today!*

REPUBLIC STEEL

Republic UNION COLD DRAWN STEELS



with MANHATTAN DIAMOND WHEELS

Exclusive Manhattan bonding also permits the grinding of soft or hardened steel shanks in conjunction with grinding carbide inserts without loading or glazing.

Unexcelled for precision grinding of Carbides on surface, cylindrical or internal operations.

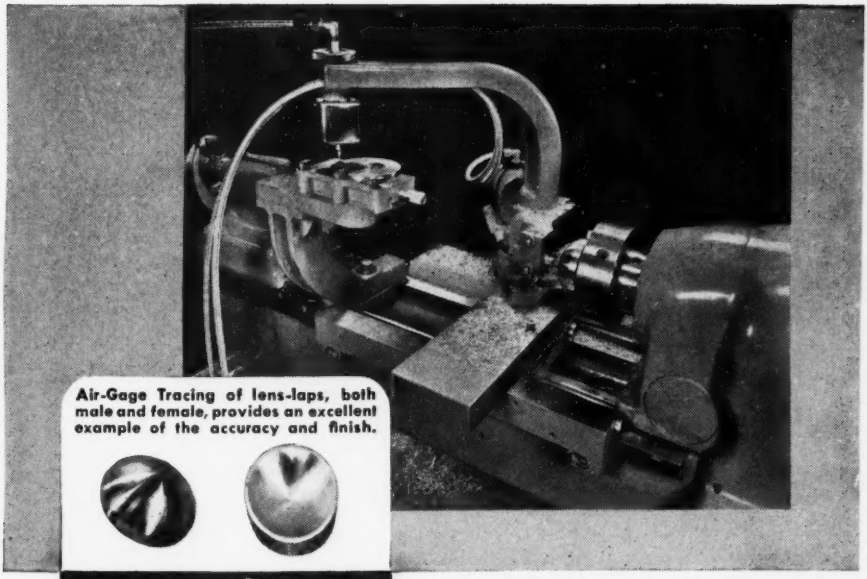
NO DRESSING **GREATER ECONOMY**

DIAMOND WHEEL DEPARTMENT

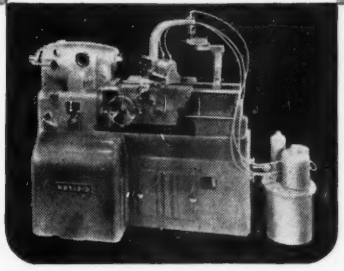
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls



Air-Gage Tracing of lens-laps, both male and female, provides an excellent example of the accuracy and finish.



NOW!

All the Advantages of AIR-GAGE TRACING Available for SMALL, HIGH-SPEED WORK

• Here's a new Monarch high-speed contour turning team to *push your costs way down.*

The proved advantages of Air-Gage Tracing now are available on the famous Monarch high-speed 10" EE Precision Manufacturing Lathe.

By the exclusive Air-Gage Tracing method you can turn step shafts; turn, bore and face contours of innumerable kinds. This is done in a fraction of the usual machining time, at a fraction of normal costs—*and with better accuracy and finish.* Let us supply you with complete details.

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER* — TURN TO MONARCH

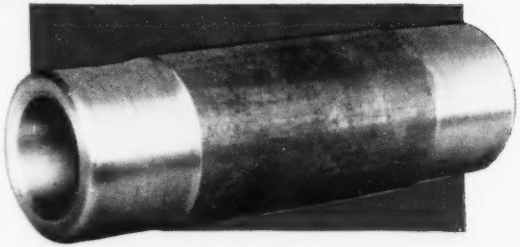
MAINTENANCE COST FOR THESE 4 MACHINES:

LESS THAN 2 7/10¢ PER HOUR
FOR 25,913 HOURS' CONTINUOUS PRODUCTION!

Here's a battery of four machines that has been continuously operating for 25,913 hours, producing a total of 1,215,853 pieces—and at an over-all maintenance cost of only $683.40. That figure covers both labor and materials.

In other words, maintenance averaged only $170.85 per machine! And bear in mind, this remarkable record was made on heavy duty work—the kind that puts a machine to severe test for stamina and sustained accuracy.

Acme-Gridley Automatics are built with basic design advantages for such low-cost performance: The rigid, box-type frame resists vibration, *holds* precision on heavy cuts. Positive, direct, quick-change camming eliminates the need for adjustments to take up wear in loose-connected linkages. It will pay you to investigate Acme-Gridley Automatics when you want the most in metal turning—more good pieces in the pan—with minimum maintenance. May we give you more information?



JOB FACTS

Part: Track Link Bushing.
Size: 2⅝" Diam. x 8" long; 7½ lbs.
Material: Steel Tubing.
Machine: Acme-Gridley 2⅝" RB-8 Spindle Automatic Bar Machine.
Performance: Battery of 4 machines operating continuously for 25,913 hours.
Production: 1,215,853 pieces.
Maintenance Charges: $683.40 total (including labor and materials).

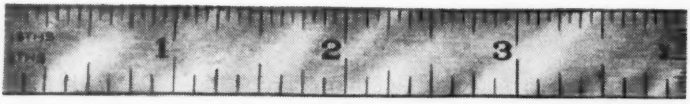
The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Van Keuren WIRE TYPE PLUG GAGES

VAN KEUREN FULL 2" GAGE



AGD 1¼" GAGE

WHICH GAGE WILL YOU BUY?

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies are now free upon request.

Wire Type Plug Gages were originated by The Van Keuren Co. over 25 years ago. In 1948 this design was adopted in shorter lengths as the AGD standard for gaging holes from .030" to .510" diameter. The Van Keuren Co., because of years of pioneering, is able to offer the extra length at little or no extra cost.

You cannot afford to lose this extra length. When you need plug gages obtain a quotation from The Van Keuren Co.—Compare COST PER HOLE GAGED. You can be assured of quality and accuracy. A double inspection at the factory eliminates your inspection expense. No time will be lost waiting for replacements. You can count on prompt delivery from a stock of 2 million wires. Specify Van Keuren wire type gages and get the most GAGE for your GAGE DOLLAR.

Send for Supplement 19 showing quick and easy method of getting 4 to 10 gages from 1 VK wire type gage unit.

Available in

TOOL STEEL **HIGH SPEED**
CHROMIUM PLATE **VK CARBOLOY**

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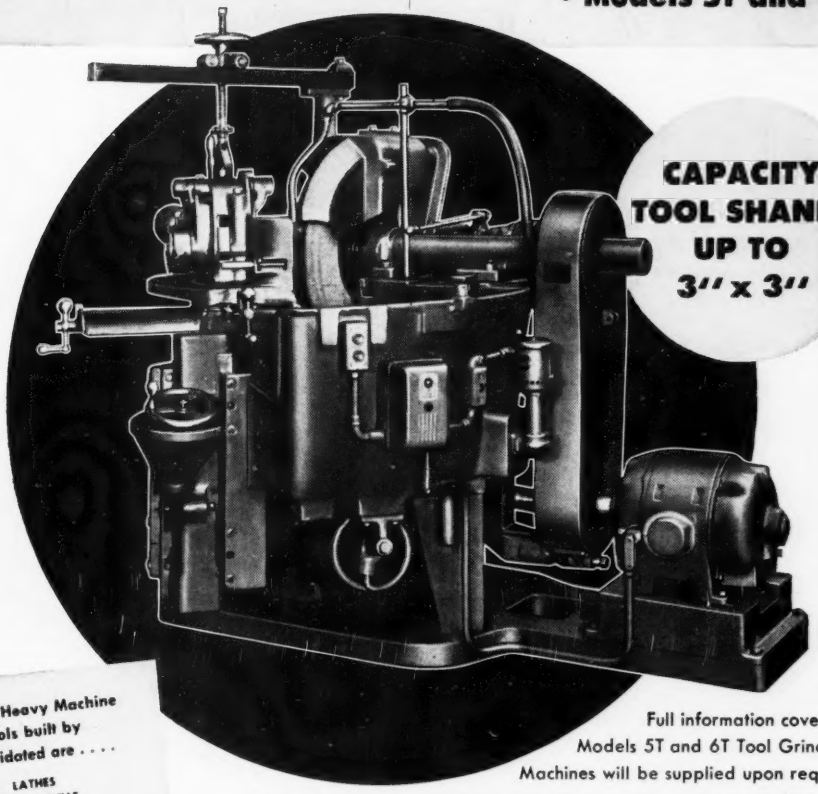
THE Van Keuren CO., 175 WALTHAM STREET, WATERTOWN, MASS.

31st Year

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

SELLERS
TOOL GRINDING MACHINES

• Models 5T and 6T



CAPACITY TOOL SHANKS UP TO 3″ x 3″

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

Full information covering Models 5T and 6T Tool Grinding Machines will be supplied upon request

The Sellers Tool Grinder has a fully universal tool holder which permits any plane face of a tool to be presented to the grinding wheel without resetting, enabling it to be ground with a minimum expenditure of time and labor. Designed for grinding straight face tools and round nose roughing tools for lathes and planers. Holders and chucks can be furnished for grinding spade drills, shearing knives, boring tools and small tool bits. Capacities: Model 5T, tool shanks up to 2½″ x 2″. Model 6T, up to 3″ x 3″.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Timely Tips in Time-Saving Finishing

Brightboy Rod in drill press, burring and polishing inside of guide hole.

Cleaning and smoothing of threads with Brightboy hand tablet.

Polishing base of elbow tube with Brightboy Wheel.

Your best opportunity today to save more, profit more, lies in improved time-and-labor-saving operations. By frequently combining BURRING, FINISHING, CLEANING, POLISHING *into one operation,* rubber-cushioned Brightboy is bringing down production costs for many manufacturers in the fields of metalworking, woodworking and plastics products.

Smoothing and burring dural and stainless steel parts with Brightboy Wheel.

COST-SAVING DATA FOR METHODS & PRODUCTION MEN, for comparison with your presently-used methods and materials, may be had from your dealer; also the Brightboy Catalog-Manual. Write the Brightboy Service Department on any production or methods problems where finishing is involved.

A perfectly "balanced" combination of abrasive and rubber, Brightboy is used following the rough grind. It:

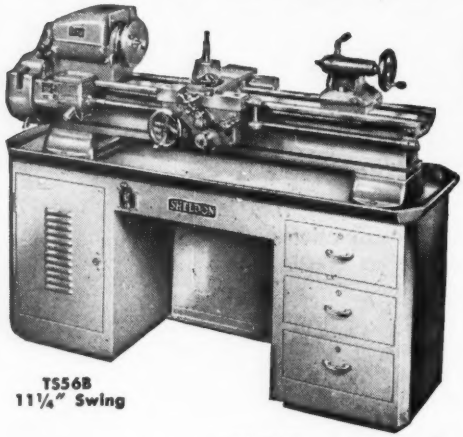
1. Bridges the gap following rough grind, through the buff, frequently in one operation.
2. Works to close tolerances; can be shaped to contour.
3. Produces a wide variety of conventional and special finishes and patterns; frequently the final polish.
4. Requires no before-use preparation or dressing; no skilled labor to handle it.

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co., Newark 7, N. J.
America's Pioneer Manufacturers of Rubber-Bonded Abrasives

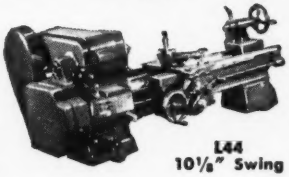
WELDON ROBERTS
Brightboy
REG. U.S. PAT. OFF.

SHELDON

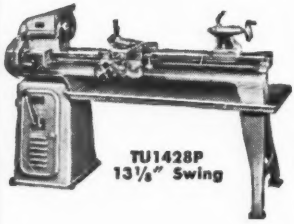
When is a lathe too big?



TS56B
11¼" Swing



L44
10⅛" Swing



TU1428P
13⅛" Swing

A lathe is too big when:

(1) When it is too large and complex for any but the most experienced to operate safely.

(2) When the power cost is excessive for the tool load.

(3) When the tool investment is out of all proportion to the requirements.

(4) When it is too cumbersome and too slow.

(5) When it takes up floor space, heat and light in which output could be multiplied with smaller machine tools.

Modern Sheldon Precision Lathes, eliminate these excess costs and loadings—leave far more on the profit side. 10", 11" and 12" Swing. "Zero Precision" Tapered Roller Bearings. Increased collet capacity.

Write for catalog.

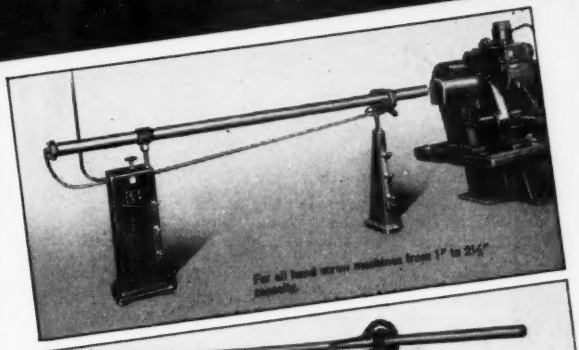
SHELDON MACHINE CO. Inc.

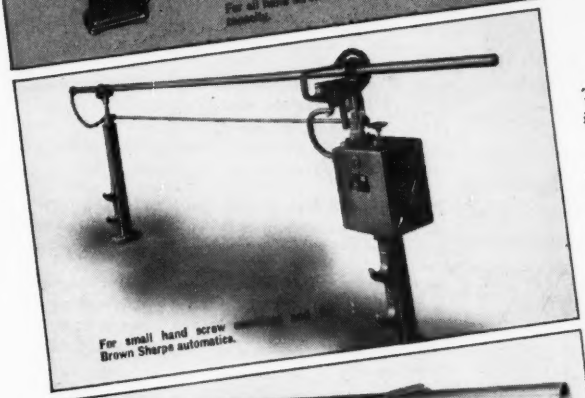
Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

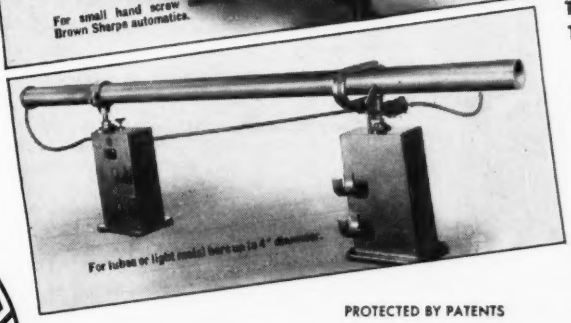
4250 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

IN ONE FEED-OUT

can you feed any desired length up to full length of stock?







LIPE

PNEUMATIC BAR FEEDS

Will do it!

Lipe Bar Feeds make long feed-outs possible. The piece is not grabbed by feed fingers; instead, it is pushed automatically by an air driven piston.

Feed-fingers and feed-finger mechanisms are eliminated entirely, yet these Bar-Feeds will feed any required distance right up to the smallest end-piece. This is done without marring, scratching, or deforming. A fast, safe method that steps up production, saves spoilage!

Lipe Bar Feeds Are Made For Any Type Machine Where Stock Is Fed Through A Spindle.

You can get a Lipe Bar-Feed for your automatic or hand-operated screw machine, however small or large it may be.

WRITE or CALL US TODAY!

for complete descriptions and engineering data on the Lipe Pneumatic Bar Feeds. No charge or obligation, of course.

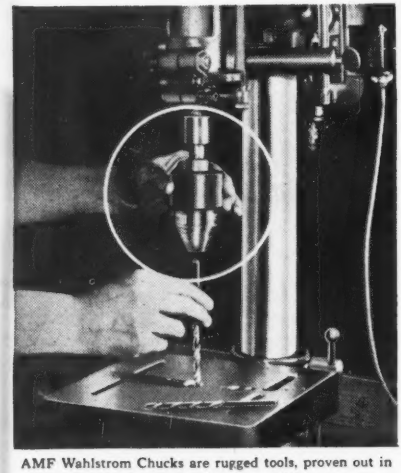
PROTECTED BY PATENTS

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION, Syracuse 1, N. Y., U.S.A.

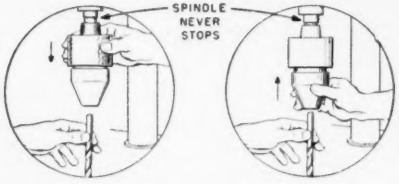
Cable Address: LIPEGEAR

Change drills in a second, safely with this Automatic Chuck while spindle is running



AMF Wahlstrom Chucks are rugged tools, proven out in many years of heavy production work. Simple construction assures ease of operation.

HERE'S ALL THERE IS TO CHANGING DRILLS



1. Grip sleeve—pull down —jaws open automatically —drill is released.

2. Insert new drill—push up tapered part—drill is locked in place.

You don't stop the machine to change drills with the AMF WAHLSTROM CHUCK. No keys, collets or wrenches are needed.

That's why Wahlstrom Chucks cut costly minutes in changing tools for drill press work or for spotting, drilling and reaming in boring or milling machines. They'll also save money in lathe work for burring, turning, filing, etc. *One spindle does the work of several.*

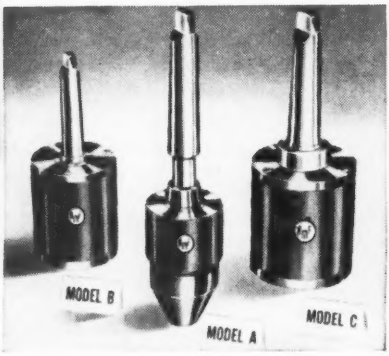
Tools last longer, too...smooth, hardened and ground jaws grip tight without chewing into tools. Grip increases with the load.

For fast, uninterrupted production, use the quick-change AMF WAHLSTROM CHUCK. It is the only fully automatic drill chuck which holds the widest range of straight shank tools...Model A—1/32" to 1/2 ; Model AA—1/64" to 3/8"

See your local distributor or write today for Bulletin 56-1.

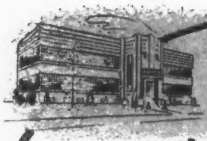
WAHLSTROM TOOL DIVISION, AMERICAN MACHINE & FOUNDRY CO.
5502 SECOND AVENUE BROOKLYN 20, N. Y.

THESE WAHLSTROM TOOLS CUT COSTS, TOO



Wahlstrom Chucks are available in several size ranges:
Model A—1/32" to 1/2"; Model AA—1/64" to 3/8".
Model B—15/64" to 1/2"; 3/8" to 3/4"; 17/32" to 1".
Model C—Holds any size tool with No. 1, 2, or 3 M. T. Shank.

WAHLSTROM
fully automatic
DRILL CHUCKS
NO KEYS, COLLETS OR WRENCHES

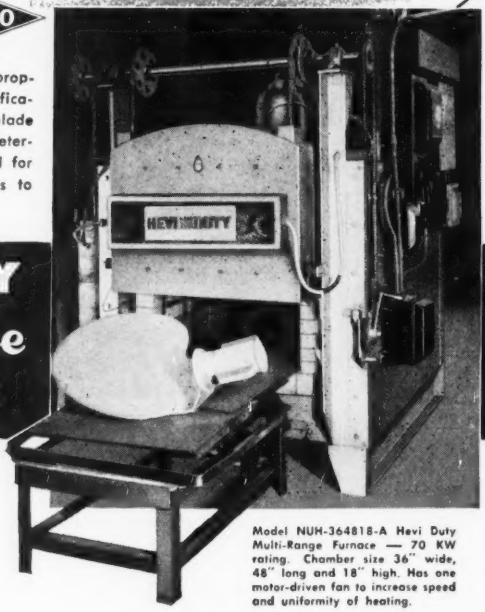


...Accurate Control...

is a MUST at AMPCO METAL, Milwaukee

Case History at AMPCO

To obtain definite physical properties that meet strict specifications, this large propeller blade is heat treated at a predetermined temperature and held for the proper number of hours to produce desired results.



Model NUH-364818-A Hevi Duty Multi-Range Furnace — 70 KW rating. Chamber size 36" wide, 48" long and 18" high. Has one motor-driven fan to increase speed and uniformity of heating.

HEVI DUTY Multi-Range FURNACES

Ampco alloys are made in various grades and modifications. The modifications depend on heat treating which must be accurately controlled to obtain desired physical properties. One of the great advantages of Hevi Duty Furnaces is their ability to hold uniform temperatures throughout the heat.

Hevi Duty Multi-Range Furnaces are all-purpose furnaces that give you a range of temperatures from 400°F. to 1850°F. with a high degree of uniformity. They are available with single or multiple fans and controls for special programs.

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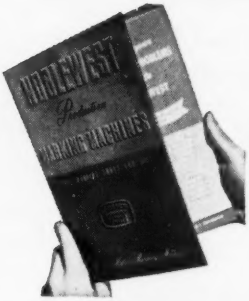
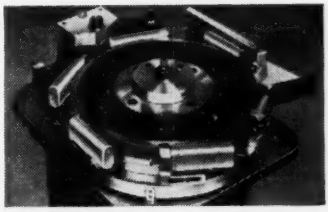


Write for catalog "Modern Marking Methods."

Insert shows Model 157 tooled for marking General Electric metal capacitors at speeds of 60 to 70 per minute.



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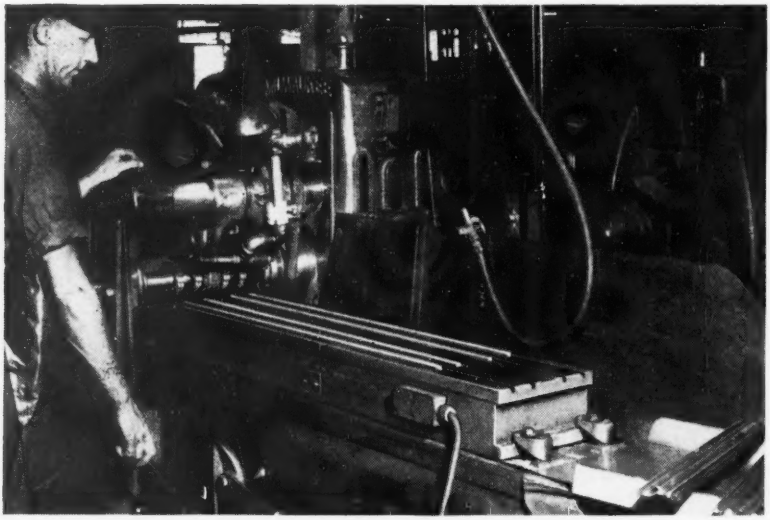
Tripled PRODUCTION . . .

That's What Remington Rand Did With MAGNA-LOCK Magnetic Chucks



JOB—mill clearance cut and 90° "V" cut on Carriage Rail Lower Race.

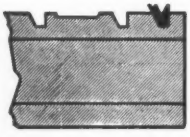
FORMER METHOD — climb milling (2 machines) two set-ups and two manually operated fixtures for each machine.

Production	70 pieces per hour
Cost	$0.0241 each
Rejects	25%
Total Scrap	6%

PRESENT METHOD — climb milling (2 machines) one set-up and one MAGNA-LOCK SUPREME 10" x 48" Magnetic Chuck* for each machine.

Production	200 pieces per hour
Cost	$0.00812 each
Rejects	None
Total Scrap	0.2 of 1%

***PAID FOR BOTH CHUCKS IN 57 WORKING DAYS**



Cross-section of chuck showing recessed top plate with work piece in position.

C. J. Beard, Methods Engineer, Remington Rand, Elmira, New York, says:
"We are so well satisfied with the results of this set-up that we are in the process of tooling-up new parts, using MAGNA-LOCK Magnetic Chucks."

Write for complete details . . . Dept. MM-10

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A PEDRICK PRODUCTION BENDER GETS THEM....

Circles, helical coils, or simple bends may be made on a Pedrick Production Bender at a very low cost. This is so because the machine is inexpensive to buy but efficient to run. Apprentice labor can produce bends equal in quality to those made by a Journeyman Machinist. All the operator has to do is to put the piece in and push a button. A jig locates the bend and a relay controls the curvature. The result is a bend like this costing about 1c.

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COSTS DOWN

WITH

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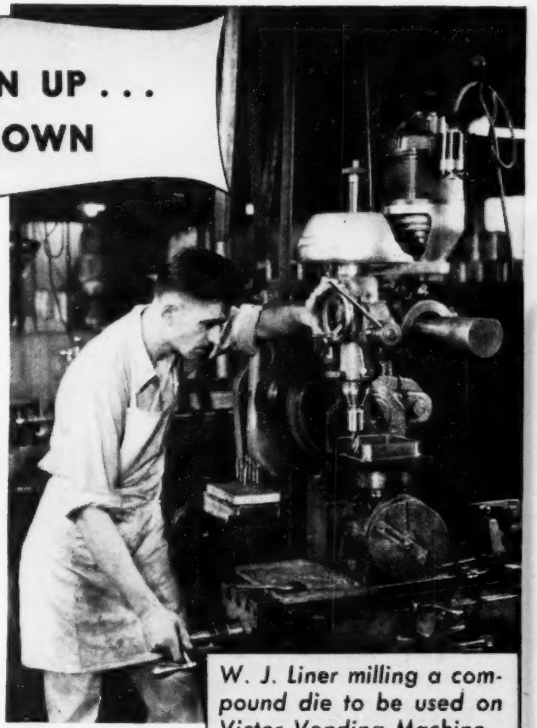


W. J. Liner milling a compound die to be used on Victor Vending Machine.

The Liner Machine and Tool Works, who fabricate parts to be used on Victor Vending Machines, is just one of the many machine shops using the Rusnok Milling Attachment on jobs that normally would call for expensive special equipment. The use of the Rusnok Attachment changes a single operation mill into a versatile machine that affects a 3 in 1 saving in time, space and money. On this particular Liner plant operation alone, production was increased 60 percent using less man hours.

Rusnok Attachment quickly converts your horizontal mill to do vertical or angular milling, drilling and boring operations. For further information on how the Rusnok Mill Head will fit into your operation write for the name of the nearest dealer.

HEAVY DUTY **RUSNOK** ATTACHMENT

MILLING • DRILLING • BORING

RUSNOK TOOL WORKS • 4840 W NORTH AVENUE • CHICAGO 39, ILL

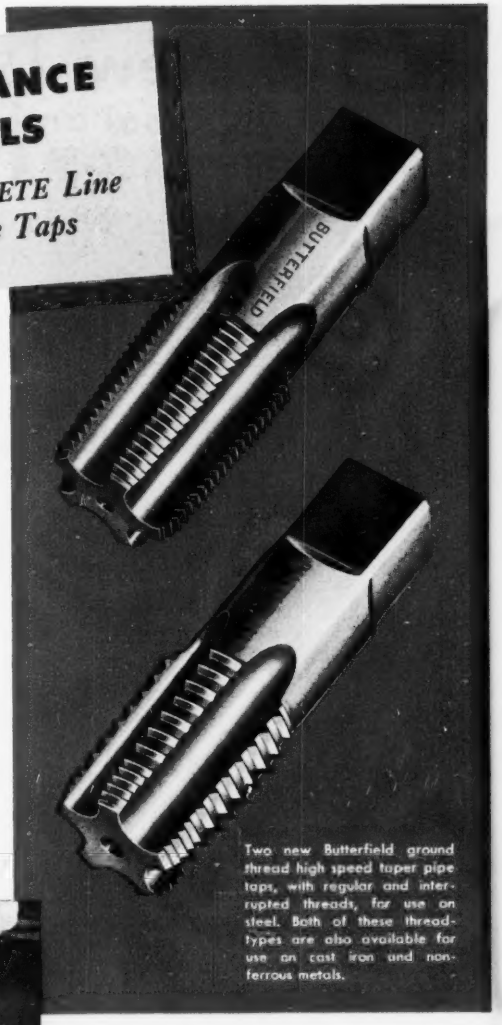
TOP PERFORMANCE IN ALL METALS

With Butterfield's COMPLETE Line of 100% Inspected Pipe Taps

Working with some of the largest industrial users, Butterfield has achieved distinct advancements in the performance of pipe taps. Notably, in the development of a special type for steel and another for cast iron and non-ferrous metals — both of which have been thoroughly proved in actual use.

Among other Butterfield contributions in the pipe-tap field you'll find a full range of dryseal-form taps, taper and straight, with ground threads. Eliminating the annoyance of compounds, their Butterfield-engineered accuracy is your assurance of faster, easier, lower-cost sealing of joints and fittings.

Butterfield taper pipe taps are available with ground or cut threads, regular or interrupted, also regular straight, in high speed steel and with regular taper or straight threads in carbon steel — *all individually inspected* . . . See your nearby Butterfield distributor for prompt service. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.



Two new Butterfield ground thread high speed taper pipe taps, with regular and interrupted threads, for use on steel. Both of these thread-types are also available for use on cast iron and non-ferrous metals.

Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

A complete line
—DISSTON BITE-RITE* FILES
from a single good source
—YOUR LOCAL DISSTON INDUSTRIAL DISTRIBUTOR

The hardest place to make good is...at home!

DISSTON BITE-RITE* FILES are doing just that. Right in Disston plants thousands of dozens of files are used annually in the regular production of other fine Disston tools. These files prove their ability to do the toughest kind of high-precision work, within rigid cost limits. *That's what Disston makes them for!*

Others in all lines of industry are likewise guarding quality, speeding schedules, and economizing, by using Disston Bite-Rite Files. *Disston Skill* makes each shape and cut precisely uniform. And *Disston Service* is ready to help you get every last penny's worth of good work out of the Disston Files you buy. For there is a qualified Disstoneer available to analyze operations for you, and consult with you on applying Disston Files and other metal cutting tools most efficiently. *He will help you lick the jobs that lick the average tools!*

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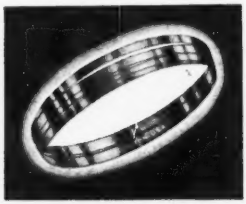
DISSTON METAL-CUTTING BAND SAWS
You can get the correct types from the Disston line—Hardened Throughout and Hard Edge Flexible Back (in regular and buttress tooth patterns).



DISSTON HACK SAW BLADES
for a wide variety of machine and hand metal cutting operations.

IN THESE TYPES: *High Speed • Di-Mol • Chromol* • Duraflex**

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*REG. U. S. PAT. OFF.

L-W

SWIVEL BASE MILLING MACHINE VISES

MASTER $46.95
Jaws: 6½" wide, 2" deep.
Opens 4" with jaws, 5¼" without.
Wt. complete with crank, boxed, 85 lb.

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Jaws: 4½" wide, 1¾" deep.
Opens 3" with jaws, 3½" without.
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Jaws: 3" wide, 1" deep.
Opens 2" with jaws.
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STEEL JAWS
Suited to drill press and shaper work.

GRADUATED BASE
Can be used plain or swivel.

LARGE ACME STEEL SCREW
Contributes sturdiness and durability.

FOUR BOLT AND KEY SLOTS
are provided for rigidly attaching to machine table so that work holding surfaces are at true right angles or parallel to table.

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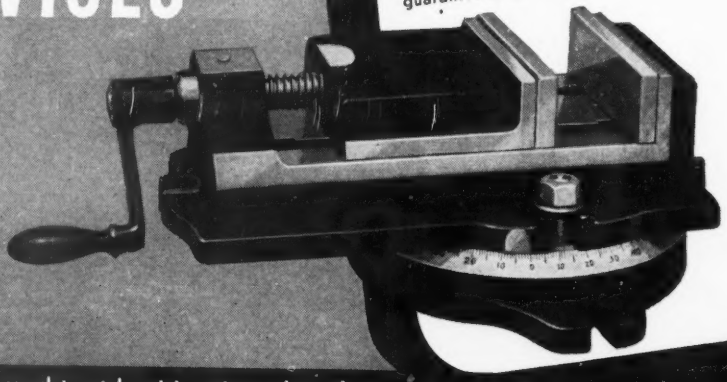
So sure are we that you'll be more than happy with the way any L-W product does a good job for you, we offer an unconditional money-back guarantee of satisfaction.



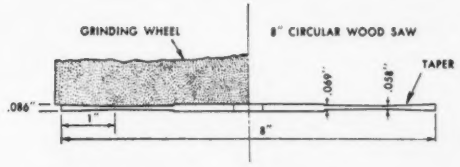
Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 28 SO. ST. CLAIR ST. TOLEDO 4, OHIO

Adaptable New Thompson Surface Grinders

LOWER COSTS

In a wider range of industrial applications



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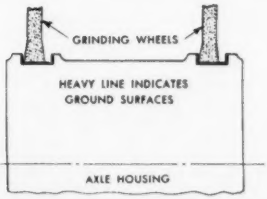
TRUFORMING MACHINE GRINDS CIRCULAR WOOD SAWS

IN 300% LESS TIME

This Thompson Circular Saw Truforming Machine grinds 8 inch high carbon steel wood saws in 2½ minutes. Formerly this job required 2 operations and 8 to 10 minutes on a circular single chuck grinder. Machine is available in 6 to 12 inch and 6 to 16 inch sizes.

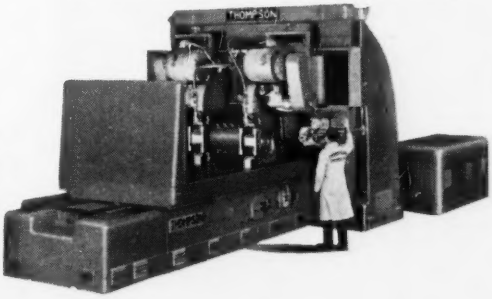


Thompson Hydrail Grinder (widest surface grinder built) reduces finishing time on massive diesel locomotive bearing housings and grinds to a tolerance of .0008" over 72" x 120" area. Machine illustrated is 72" x 36" x 120". In other industrial applications can sharpen large dies eliminating stripping down and assuring that all surfaces will be in correct relation. Horizontal or vertical wheel heads or both available. *Write today for details or other information concerning possible application of Thompson Surface Grinders in your production work.*

HYDRAIL GRINDER DOES

3-DAY JOB IN 2 HOURS

ON LOCOMOTIVE BEARING HOUSINGS



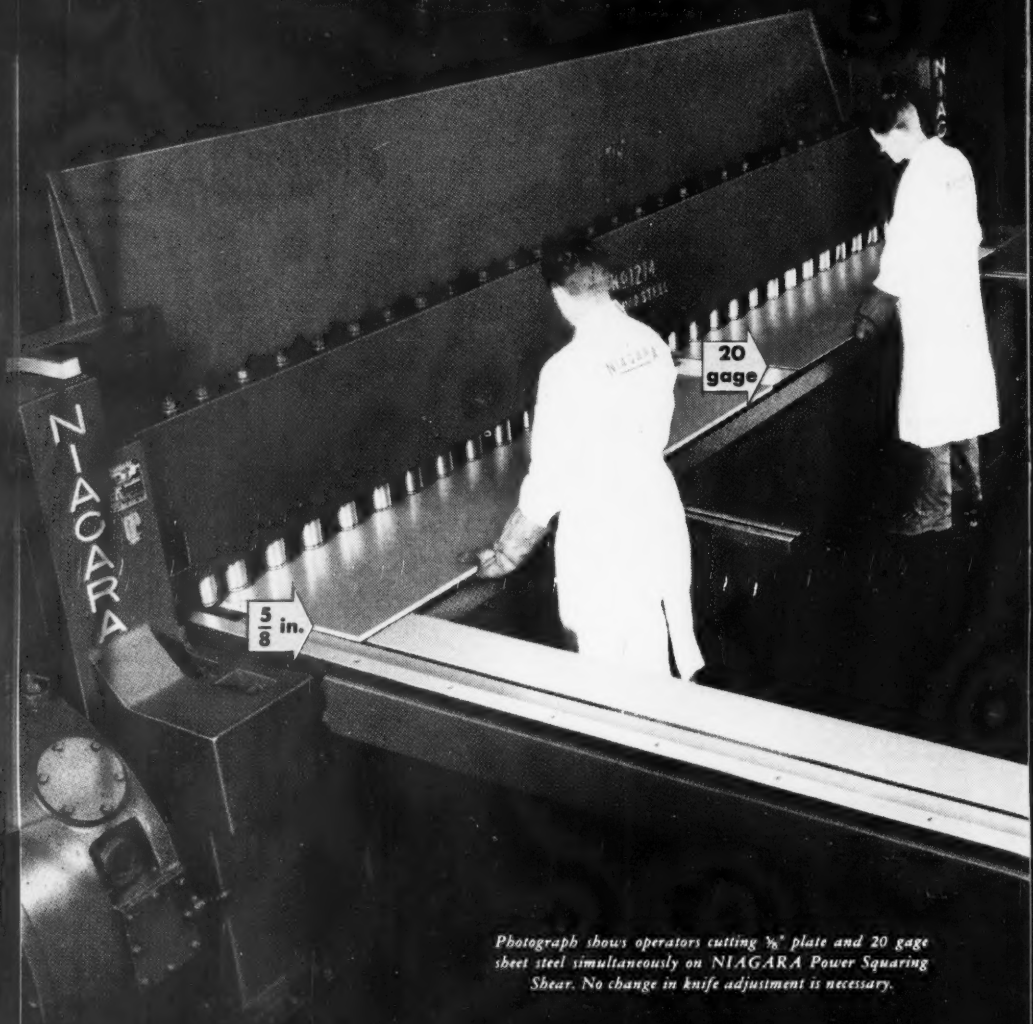
The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

 Dept. 13

CUTTING 20 GAGE and 5/8" PLATE SIDE-BY-SIDE AT ONE STROKE



Photograph shows operators cutting 5/8" plate and 20 gage sheet steel simultaneously on NIAGARA Power Squaring Shear. No change in knife adjustment is necessary.

The ability of Niagara Power Squaring Shears to cut thick and thin plate both at the same time with the same knife setting is a dramatic demonstration. Visitors at our plant can see this done every day. There is no necessity for tinkering with the knife adjustment.

Demonstrates The Sound Engineering Design of

NIAGARA

POWER SQUARING SHEARS

● There is no compromise with sound, proven engineering when it comes to NIAGARA shear design and construction.

Accurate cutting depends primarily on rigidity of the shear's components.

For bed, crosshead and holddown NIAGARA uses CLOSED BOX SECTIONS to resist with minimum deflection the horizontal, vertical and diagonal or torsional loads to which every shear is subjected.

NO OTHER SECTION WILL DO THIS JOB AS EFFICIENTLY.

Angle or channel shaped sections have long since been abandoned for use on NIAGARA Power Shears.

The economy of quality is remembered long after price is forgotten.

BED, CROSSHEAD & HOLDDOWN DESIGN

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK

ARMSTRONG

TOOL HOLDERS . . .
for every operation!

There are ARMSTRONG TOOL HOLDERS in sizes and types for every operation on lathes, planers, slotters and shapers—for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

Write for our new S-48 Catalog.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5228 West Armstrong Ave., Chicago 30, Illinois

MODERN
Machine Shop

JANUARY, 1950 • Vol. 22, No. 8

FEATURES IN THIS ISSUE

The Story of Two Men With a Plan

Employees at Market Specialties Are in Business for Themselves

By Fred W. Vogel

LOCATED in the heart of eastern Cleveland's great industrial section is a small one-story brick building that houses Market Specialties Company. In appearance, the building resembles any one of the hundreds of jobbing machine shops which one may find in almost every industrial section of the country. Its interior, too, with its layout of machine tools which are designed to perform an endless variety of basic machining operations and the signs of bustling activity is similar to many other jobbing shops. The similarity to other shops of the jobbing variety ends, however, when you begin to analyze the unique plan under which this shop is operated. At Market Specialties many of the men in the shop are in business for themselves.

To fully understand the formation and operation of this shop in which many of the workers own the machines at which they work it is necessary to go back more than two years to the time when its co-owners George Zerby and Edward Ranney were faced with many problems. Materials and labor costs had risen to a point where profitable operation of the business was almost impossible.

With a shop partly full of machines and only Zerby and Ranney available to solicit new business as well as to search for new sources of scarce materials it became apparent to those two men that continuance in business meant obtaining additional help and

additional capital. When hope had almost vanished, they hit upon the plan of offering other skilled machinists the opportunity to either purchase one of the machines already in the shop or to buy one on the market and have it installed in the shop.

Tom Horvath, a machinist with some 30-odd years' experience on screw machines, was the first to take advantage of the plan offered by Zerby and Ranney. In March 1947, he purchased a secondhand Warner & Swasey No. 3 turret lathe for $2,000 from George Whalley Company, machine and tool dealers of Cleveland, and had the machine moved to the Market Specialties shop.

About the same time, Robert Haye, who with a small amount of machine shop experience and with a tidy sum which he had wisely put aside for the time that he could invest in a business venture of his own, decided that the Zerby and Ranney proposition offered unlimited possibilities. So he, like Horvath, bought a machine. In his case, however, Haye purchased for the sum of $1500 a Reed-Prentice 16-inch x 4-foot engine lathe which was already in the shop and owned by Zerby and Ranney.

These are but two examples of a number of men who have joined Zerby and Ranney in their attempt to prove that cooperative effort—which is still possible in our type of economy—can succeed.

Each new applicant is carefully screened by Zerby and Ranney and by other owner-operators. Requirements are character, operating ability, and equipment that will not conflict with machines already installed. If the applicant passes, other members of the firm vote him into their company-wide operating agreement.

With a nucleus of a half-dozen men or so Zerby and Ranney made contacts for business. In the beginning firms such as Skidmore Gear, Chase Brass, Bryant Heater and others of like caliber began sending work orders to be processed at Market Specialties. These companies found that through the cooperative effort of the jobbing shop, their work was being processed more rapidly than it had ever been before. The secret of high production lay in the man at the machine who, with pride of ownership and self-assurance, now possessed the initiative to turn out more and better work.

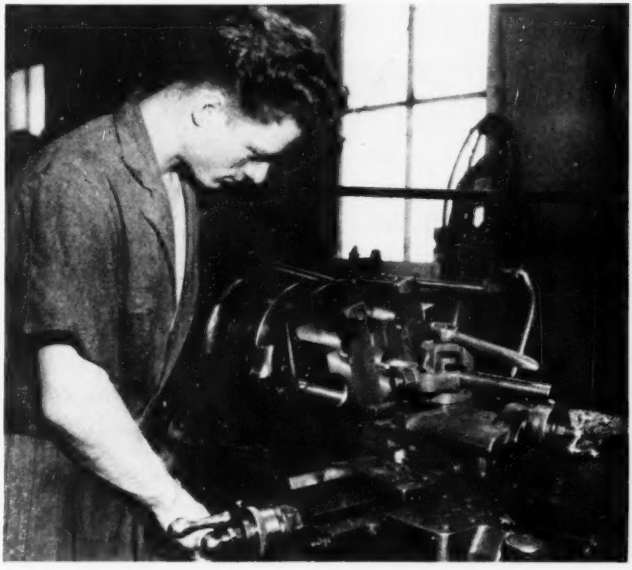


Fig. 1 — Illustration showing Robert Haye boring taper in pointer die block.

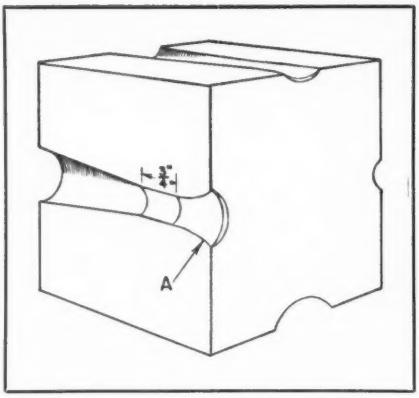


Fig. 2—Sketch of pointer die block.

Although Zerby and Ranney made the initial contacts for work contracts because of their wide acquaintance with the field, many orders followed in which a member of the shop on whose machine the work was to be done was called in for consultation. This has led to a situation whereby a manufacturer may contact the machine operator directly to quote on a job. In several instances, the operator himself, having information to the effect that a particular job was available has gone directly to the manufacturer and quoted on the job. In other words, the individual machine owner may act on his own in order to secure new business if the occasion arises.

Some of the jobs which come into the shop require a number of operations, thus the operator of a screw machine, lathe, and shaper may be called upon to quote jointly on a particular job. In instances of this nature each **owner** goes over the "prints", determines the part of the job which can be performed on his machine, estimates the length of time which will be required, and then submits a bid. All the bids are then combined, and to this is added a predetermined overhead charge in order to arrive at the quotation for the job. If the job requires an operation which can be performed on several similar machines, then each owner of the similar machines is requested to submit a quotation and the average of the various quotations will be the one which appears on the quotation for the customer. Thus, payments to machine owners are made on the basis of the bid each entered for the job, with a deduction to cover heat, light, water, rent and other incidental expenses.

One of the interesting jobs among the many which Market Specialties has

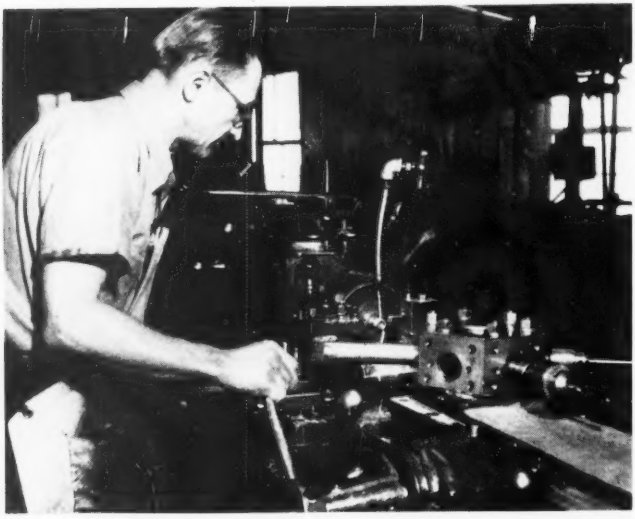
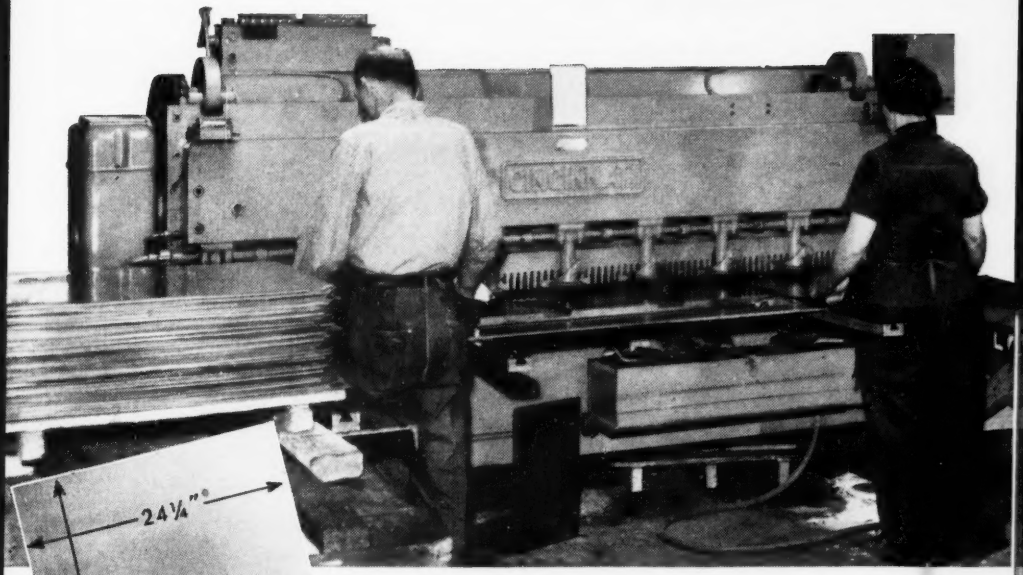
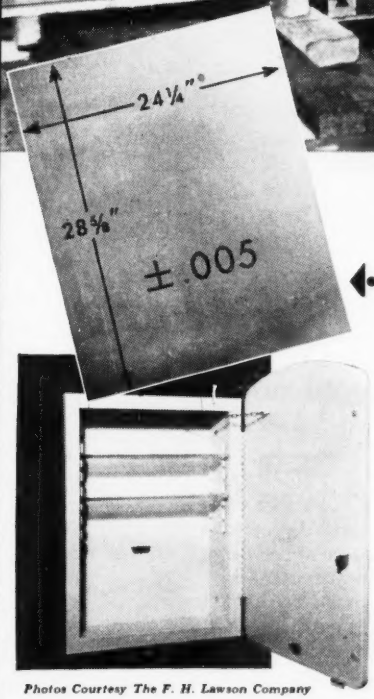


Fig. 3 — Illustration showing Tom Horvath operating turret lathe in the machining of Hi-Tensile cast-iron gears.





Photos Courtesy The F. H. Lawson Company

These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.

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←..... this accurate blank

SAVES MONEY!

At 400 an hour, accurate steel blanks, 24¼" x 28⅝", are produced in lots of 10,000 from 26 gauge stock sheets.

Costs are low because of the accurate performance, rapid gauging, ease of control and safety features of Cincinnati All-Steel Shears. One and one-half to two million cuts are made before knives need regrinding—an important factor in the low cost.

The shear is so accurate that all along the production line rejects are very low. Gauging for forming and bending operations is simple and rapid, assembly is smooth, time and money are saved, and a high quality of product is maintained.

Write for your Shear Catalog S-5. Consult our Engineering Department on your shearing problems.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Fig. 4 — Edward E. Ranney and George A. Zerby check finished workpiece with prints.

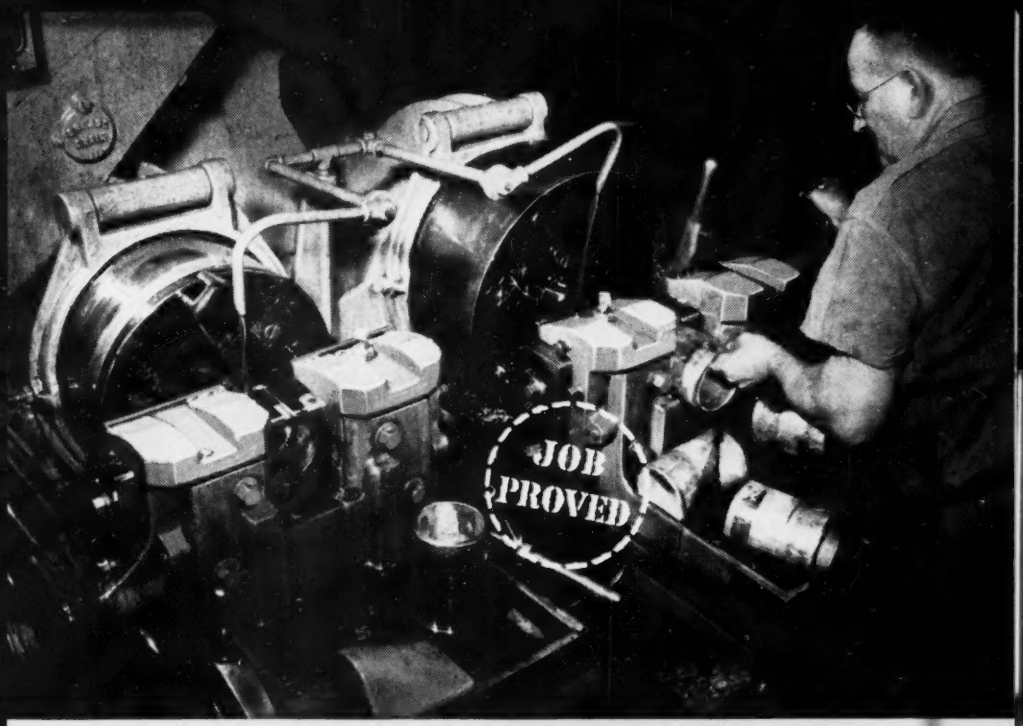
been called upon to perform is that of machining pointer die blocks which are used in the drawing of brass bar stock. A complete pointer die consists of four blocks. On four sides of each block half round holes of various diameters are machined which correspond with half round holes in one of the other blocks. Thus, with a complete set of four blocks, a total of 8 diameters are provided with the sizes of the holes ranging from 19/32-inch diameter up to 2½-inch diameter. In use, two blocks that provide the desired diameter hole are clamped together and a bar of brass of large diameter drawn through the hole which is of smaller diameter than that of the stock.

The job of machining the blocks was turned over to Robert Haye who is shown in Fig. 1 performing one of the required machining operations. Initially, the blocks are sawed from 5¾-inch square, bar, die stock. Two blocks are then clamped together side by side in a special fixture which is mounted on the headstock of the Reed-Prentice lathe shown in Fig. 1. The desired diameter hole is then drilled at a point midway along the line formed by the two adjoining blocks, thus providing upon completion of the drilling operation one half of a hole in each block. Boring of the hole follows.

The boring tool is held in the lathe tool post and hand fed into the work to generate a bell-mouth taper as shown at A in the sketch Fig. 2. The tool is reset for boring a ¾-inch length of the straight drilled section. The tool is again reset and a 4 degree relief angle taper is bored from the end of the straight section out to the ends of the blocks.

In pointing down brass bar stock, a bar of brass is fed into the bell-mouth taper, forced by means of reciprocating action into the straight section of the blocks. Obviously, the boring of the long taper is a blind operation requiring the use of a special type boring bar as well as unusual skill on the part of the operator. Prior to the development of a special boring bar by Robert Haye, the bell-mouth taper and the straight section were bored after which the blocks were turned end for end in the fixture in order to bore the long taper. With the development of the special tool, a considerable amount of time has been saved in the boring operation. The relief taper cutting speed is approximately 212 revolutions per minute.

Figure 3 shows a view of Tom Horvath machining a Hi-Tensile cast-iron gear blank which when finished will be mounted on the distributor drive shaft for driving both the distributor and oil



CHASER LIFE INCREASED 50%

Sun Cutting Oil Improves Quality of Threads, Steps-up Pipe Nipple Production

Operation: Threading 4" pipe nipples
Machine: Landis Threading Machine
Material: 4" galvanized welded steel tubing SAE 1025-1040
Speed: Threading 1½" on each end of about 300 pieces per 8-hour day
Chaser Life: 3 days before resharpening
Cutting Fluid: Sun Cutting Oil 31W

A manufacturer threading pipe nipples was not getting satisfactory finished threads with the cutting fluid in use. Chaser life was abnormally short, resulting in excessive downtime and high percentage of rejects, with consequent loss of production.

Changing to Sun Cutting Oil 31W, this shop increased chaser life 50 percent, and reports that "the threads are the best we ever made." With rejects practically eliminated and downtime for changing chasers reduced to the minimum, production has greatly increased.

Sun Cutting Oil 31W is a dark, free-flowing, sulphurized oil. It is recommended for heavy duty jobs where an emulsified cutting oil is not suitable. For further information about Sun Cutting Oils or other "Job Proved" Products for the metalworking industry, call or write the nearest Sun Office. The services of a Sun engineer are available without obligation.

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pump of a well-known make of automobile. The finish dimensions call for gear diameter 1.134 inch, gear face width $\frac{9}{16} \pm 0.005$ inch, hole size 0.498 inch, hub outside diameter 0.810 inch, and hub length $1\frac{11}{64}$ inch. The hole, gear face and gear o.d. must be held concentric and parallel to within 0.001 inch total indicator reading. The number of gears turned out by Horvath during an 8-hour day varies between 160 and 170.

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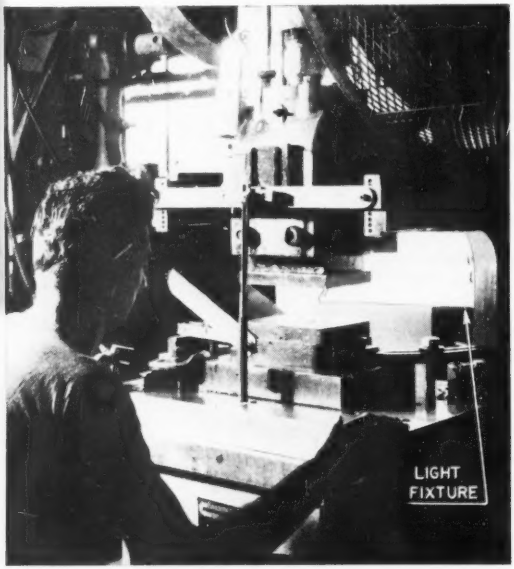
Accessories and Attachments for all types of Gilbert horizontal boring, drilling and milling machines are featured in a six-page two-color bulletin (No. 749) issued by The Cincinnati Gilbert Machine Tool Co., 3360 Beekman St., Cincinnati 23, Ohio. The bulletin presents illustrations, descriptions, and specifications on precision dial and end measuring instruments, two-way feed facing heads, full and semi-universal milling attachments, universal tilting and rotary tables, plain box tables, auxiliary tables, spindle to faceplate clamps, boring bars, and midget type openside boring bar supports.

Spacer Units. A 12-page three-color catalog published by The Bullard Co., Bridgeport 2, Conn., describes and illustrates semi-automatic spacer units for accurately positioning work in a multiplicity of predetermined positions under a fixed spindle of a radial drill.



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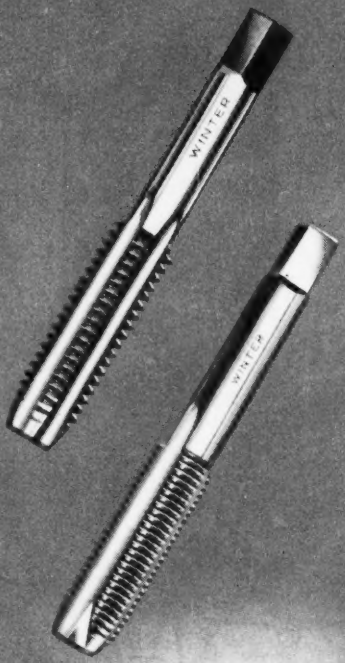

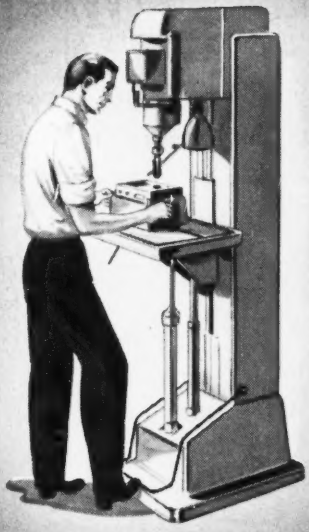

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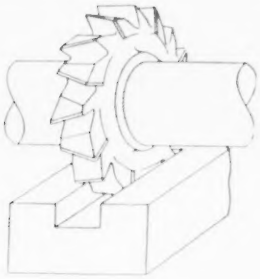

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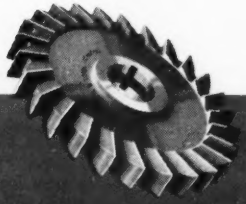

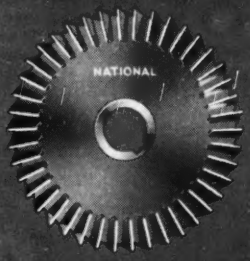

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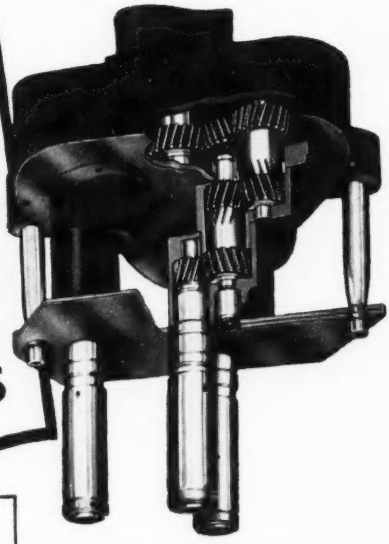

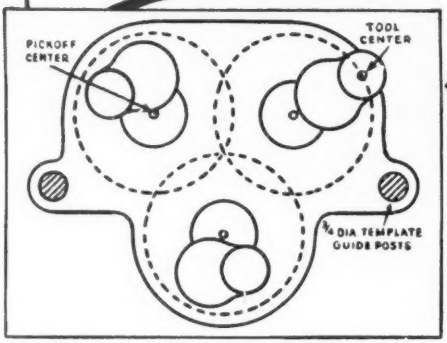

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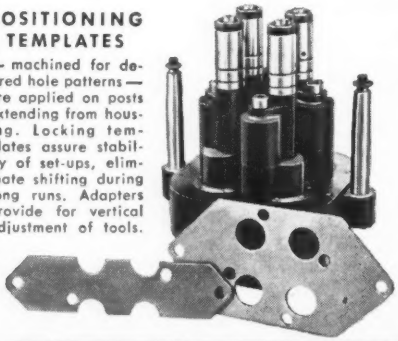

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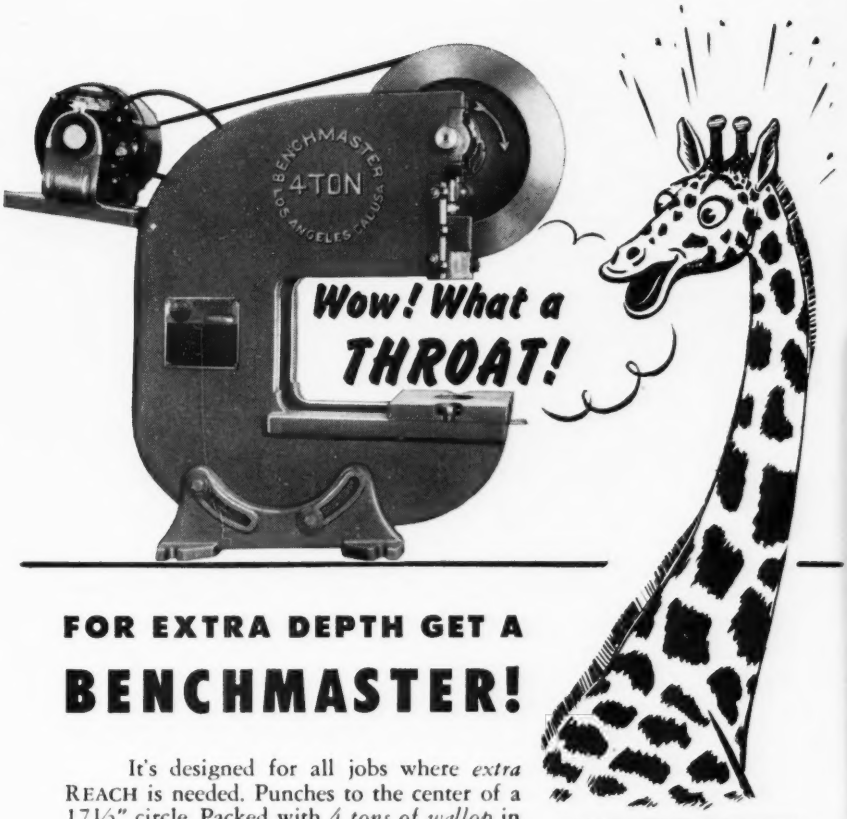

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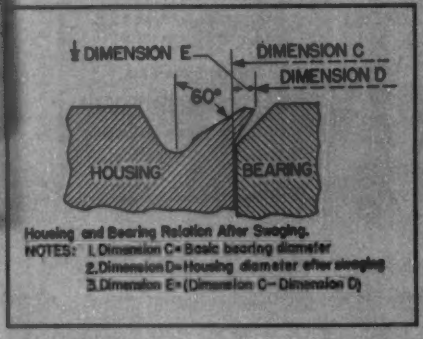
Bearing Retention By Swaging

Roller-type swaging tool developed at Northrop during investigation of swaging methods.

By Gilbert C. Close

A NEW swaging process for bearing retention, along with all necessary tool specifications and design data has been announced by T. E. Piper, Chief Process Engineer of Northrop Aircraft, Inc., Hawthorne, California. The new process has superseded nearly all other methods of bearing "staking" in the Northrop shops, and it has proved to be especially valuable for use with bearings which are operated under positive thrust loads.

Essentially, the process consists of machining a groove in a bearing housing, and then swaging the lip of the groove over onto a bearing chamfer. A diagrammatic sketch of the process may be seen in Fig. 1. The process has been standardized for standard materials used in the plant, and design data have been tabulated for these different materials, as shown in Table I.



Housing and Bearing Relation After Swaging.
NOTES: 1. Dimension C = Basic bearing diameter
2. Dimension D = Housing diameter after swaging
3. Dimension E = (Dimension C − Dimension D)

Fig. 1—Sketch showing swaging method of bearing retention.

Prior to the adoption of the swaging process, investigations were carried out in order to discover a more reliable means of bearing retention than that provided by conventional staking methods. Snap-ring and screw-ring methods of retention were not considered, and substitution of the swaging process for either of these methods would depend largely on economy and production advantages that might accrue in specific cases.

During the course of the investigations, a number of tests were run using various swaging procedures. Press swaging, which is illustrated in Fig. 2, was found to be satisfactory for the softer wrought alloys and medium steels; but when this method was used for less ductile alloys such as 75S aluminum, FS-1 magesium, and the harder cast steels, there was a tendency for the swaged rings to crack. Friction spin swaging, Fig. 3, was also tried; but with the harder alloys there was a tendency for the spinning tool to be cut despite the fact that it was tempered of Rockwell C-61.

Northrop engineers point out that the methods of press swaging and fric-

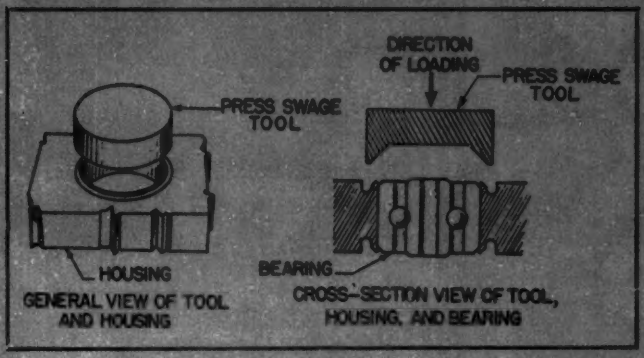


Fig. 2 — Illustration showing press swaging arrangement.

tion spin swaging would no doubt be satisfactory for bearing retention with certain alloys; however, for their purposes, the method of swaging with a roller-type tool, Fig. 4, produced the most promising results, and subsequent investigational efforts were channeled toward the perfection of this process.

From the preliminary tests of spin swaging it was concluded that:

(1) The tool face angle necessary for optimum swaging results was critical,

(2) The limits for depth and width of ring were critical,

(3) A roller-type swaging tool would be necessary in production in order to produce satisfactory results,

(4) A machined ring tapered from top to root was necessary so that a greater root cross-section and consequently a greater resistance to axial load could be obtained without affecting the ease of swaging,

(5) The push-out load obtained must be sufficiently high to allow use of the method for retaining all bearings subject to misalignment or vibrational axial loads.

With these design, production, and operational requirements in mind, a subsequent series of tests was made varying the tool face angle in the range of from 45 to 70 deg. to the housing bore axis. At an angle of 45 deg., the problem of cracking of the ring due to bending stresses was encountered with the less ductile materials such as 75ST aluminum and FS-1 magnesium. At 70 deg., insufficient clearance of the tool was encountered on some types and diameters of bearings. Therefore, 60 deg. to the housing bore axis was determined to be the optimum tool face angle for swaging.

The machined ring was tapered from top to bottom on some test specimens

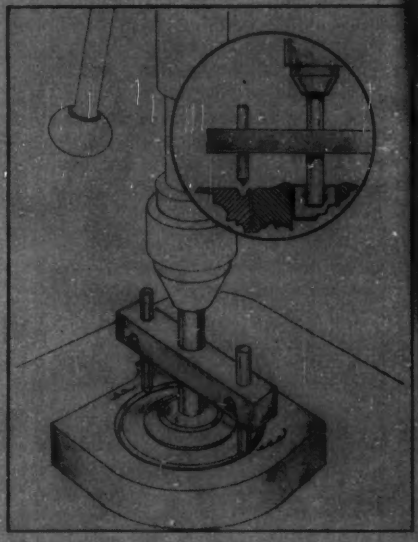


Fig. 3—Sketch showing friction spin method of swaging.

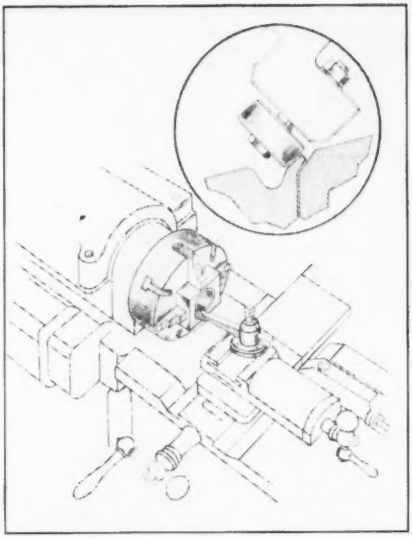
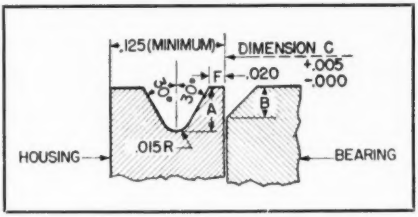


Fig. 4—Method of swaging with a roller-type tool was the method found to be most satisfactory.

and parallel sided rings were used for other specimens. It was found that the optimum ring shape was that having a taper from top to root of 30 deg. to the housing bore axis. Cracking due to bending occurred for the less ductile materials when parallel sided rings were used.

Having determined these factors, further tests were conducted in order to determine the optimum thickness of the ring, dimension F, Fig. 5; the depth of the groove, dimension A, Fig. 5; and

Fig. 5—Drawing giving design details of roll swaging method.



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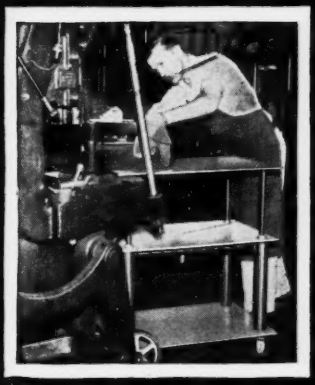

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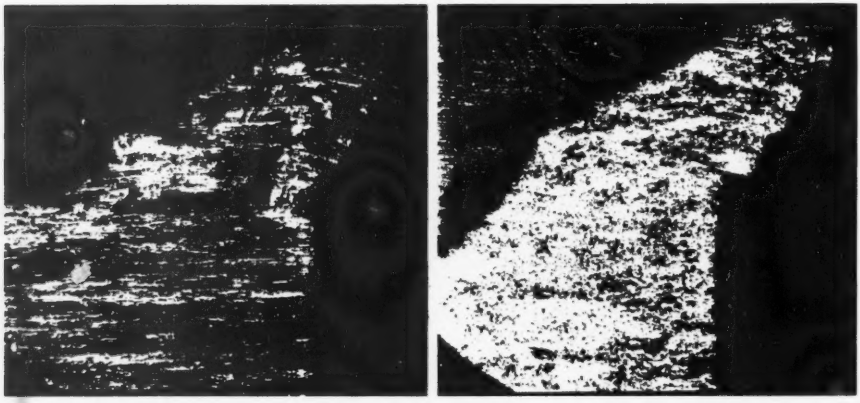

Fig. 6—Representative photomicrographs. At the left is shown a typical roll swaged structure for permanent bearing installation (35 X). At the right is shown a typical shear defect that occurs with extreme swaging (35 X).

the amount of swaging, dimension E, Fig. 1. It was discovered that satisfactory results could be obtained with dimension F between 0.015 and 0.040 inch, and therefore $0.020 \begin{smallmatrix} +.005 \\ -.000 \end{smallmatrix}$ was established as a standard.

The maximum depth of groove, dimension A, Fig. 5, which gave consistently satisfactory results from a metallurgical standpoint was 0.050 inch, and this was established as a standard. It was found that the amount of swaging, dimension E. Fig. 1, could be increased progressively to 0.050 inch without cracking of the ring but that over 0.050 inch, cracking occurred in the brittle alloys. Therefore, the maximum value of dimension E was set at 0.030 inch, allowing a considerable margin of safety in preventing cracking.

Using these standardized dimensions and tolerances, a series of tests was then run in order to establish push-out load factors. Several specimens each of SAE 4130 steel (165,000 p.s.i.), SAE 4340 steel (200,000 p.s.i.), 356-T6 sand cast aluminum, H-HT sand cast magnesium, 75ST-T6 aluminum, and FS-1h magnesium were roll-swaged over bearings which varied in diameter from 0.70 to 3.50 inches.

The bearings were then loaded axially to failure, and failure loads of the swaged rings were recorded. In addi-

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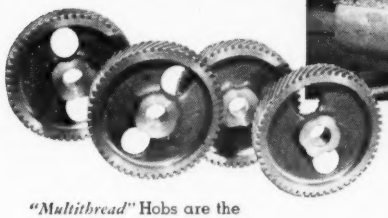

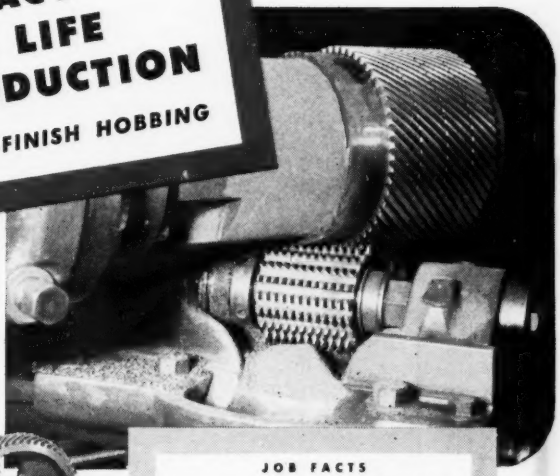

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tion, a series of identical tests were run on 75ST-T6 aluminum roll-swaged housings in order to determine the variation in failure loads which might occur. On the basis of these tests it was determined that a safe design load for roll-swaged bearings would be

$$\text{Design Load} = \frac{\text{Failure Load}}{1.5}$$

It should be noted that in designing for the roll-swage process, the manufacturer's rated thrust load for any bearing must be taken into consideration. The design load, then, must be for the lower of the two figures.

After evaluation of all tests, design data was compiled as shown in Table I, and dimensions for design and fabrication definitely established as shown in Figs. 1 and 5. During the investigations complete metallurgical examinations were made of the effects produced by roll swaging. Fig. 6 shows two typical photomicrographs which were made.

The roll swage method of bearing retention may be readily adapted to production. Tests made at the Northrop plant were all conducted on standard lathes or milling machines with test tools. The positions of the tool, tool holder, and work holder, which are shown in Fig. 7, indicate one production method which may be used on a

TABLE I—DESIGN DATA FOR ROLL SWAGING PROCESS
(See Figures 1 and 5)

MATERIAL	Dimension A Groove Depth	Dimension B Chamfer Depth	Reswaging Permissible		Permanently Installed Only	
			Dimension E (1)	Load/Inch (2)	Dimension E (1)	Load/Inch (2)
Aluminum (75S-T6)	.045 $^{+.005}_{-.000}$	.060 —.035	.010 ±.002	220	.025 $^{-.000}_{+.005}$	550
	.025 $^{+.005}_{-.000}$	.034 or less	.007 ±.002	210	.015 $^{-.000}_{+.005}$	450
Magnesium (FS-1h)	.045 (3)	.060 —.035	.010 (3)	82	.025 (3)	205
	.025 (3)	.034 or less			.015 (3)	165
Steel (6)	.045 (3)	.060 —.035	.010 (3)	325	.025 (3)	810
	.025 (3)	.034 or less	.010 (3)	435	.015 (3)	650
Aluminum Casting (356-T6)	.045 (3)	.060 —.035			.025 (3)	
	.025 (3)	.034 or less			.015 (3)	
Magnesium Casting (H-HT)	.045 (3)	.060 —.035	.010 (3)	110	.025 (3)	275
	.025 (3)	.034 or less			.015 (3)	
Steel Casting (SAE 4130)	.045 (3)	.060 —.035			.025 (3)	
	.025 (3)	.034 or less			.015 (3)	

NOTES: (1) For Dimension E, see Figure 1.
(2) The load listed above refers to the load per inch of housing circumference and therefore is applicable to all diameters.
(3) Tolerances for all materials are the same as for 75S-T6 aluminum.
(4) For Dimensions A and B, see Figure 5.
(5) SAE 4130 (165-185,000 psi)
SAE 4140 (185-200,000 psi)
SAE 4340 (200-220,000 psi)

vertical or a horizontal milling machine for producing acceptable swaged parts. With a proper means of controlling axial tool penetration, a similar method could be used on a heavy duty, low speed drill press.

The set up shown in Fig. 7 requires only one tool and tool holder in order to include all diameters of bearings. A single work holder will serve also for all diameters of bearings. However, for

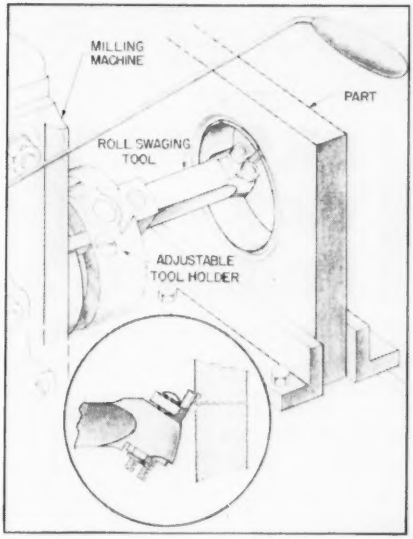

Fig. 7—Illustration showing roll swaging set up on a horizontal milling machine.

each different bearing internal diameter, a separate locating device is needed in order to position the bearing and housing in the work holding fixture.

"Drill Holes 0.002 Inch in Diameter Economically" is the title of a four-page two-color bulletin (No. 752) published by the Taylor Dynamometer & Machine Co., 5108 W. Center St., Milwaukee 10, Wis., which presents illustrations, descriptions, and specifications on sensitive drilling machines, both bench and floor types, with capacities to $\frac{5}{8}$-inch diameter.

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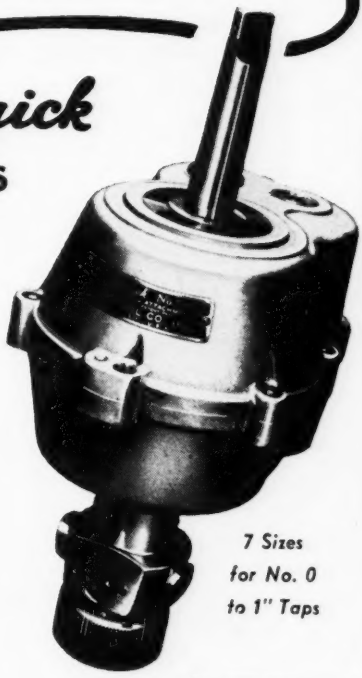

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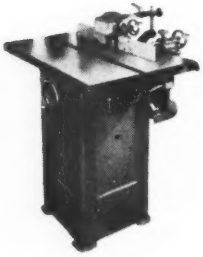

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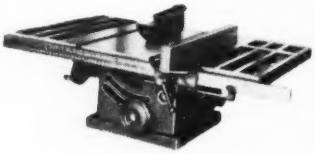

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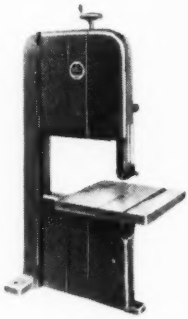

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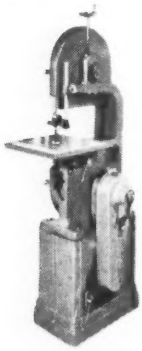

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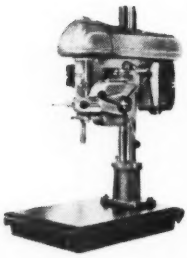

15 20 Drill
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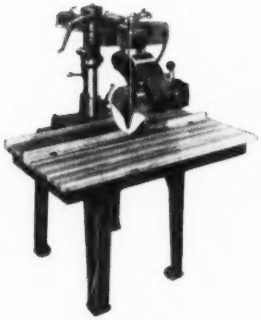

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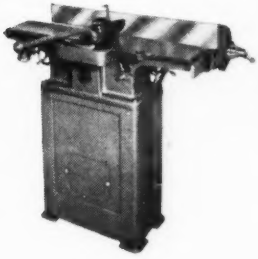

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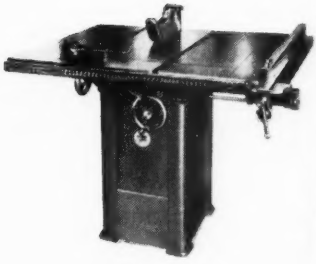

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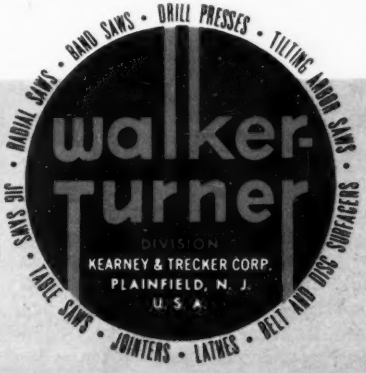


Hydraulic Housekeeping

Practical suggestions on the proper care of hydraulic systems.

By Spencer Jones

IT may be said that most of the trouble which is encountered with hydraulic equipment is due to sloppy housekeeping. The trouble is seldom due to faulty design of hydraulic circuits or to the type of hydraulic oil which is used. These facts may seem like kindergarten comments to experienced users of hydraulic equipment, but once in a while it is a good thing for us to remind ourselves of facts which we know but sometimes forget to put into practice.

The bane of a housekeeper at home is just plain dirt, and it is a similar just plain dirt that causes too many troubles in hydraulic systems. A thoroughly unscientific definition of dirt in oil could be given as, "anything undesirable in the oil that was not there when it was bought—and anything undesirable in the system that was not there when it was first put into operation."

Dirt may consist of many things—particles of the materials on which a machine tool is working, foundry sand, cutting or grinding liquids, gums, sludges, bits of packing, water, air, rust, dust, corrosives, or combinations of these. It is possible for some dirt to be strained or filtered out of a system;

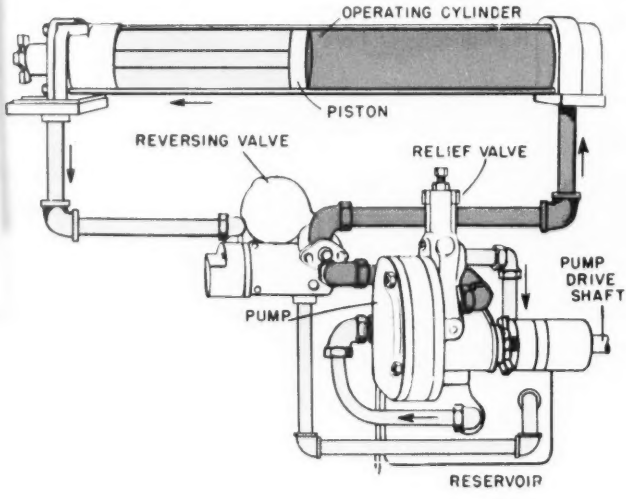


Diagram showing essential parts of an hydraulic system.

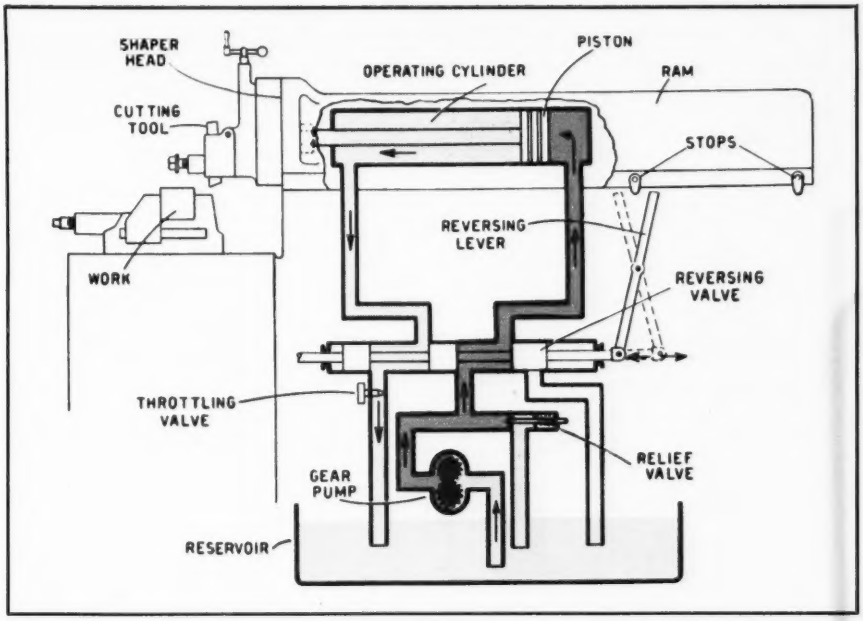


Diagram showing principal parts of a constant-volume hydraulic circuit of a shaper.

some sinks to the bottom of a tank or reservoir; some is carried in solution or rendered comparatively harmless by the hydraulic oil—and the rest of it may cause trouble.

The ideal situation would be to keep the oil and everything it touches absolutely clean. However, this is an impossibility unless the hydraulic system and machine tool are not used at all; and therefore if production is desired (and when is it not?), the practical thing to do is to keep the system as clean as possible under operating conditions in order to minimize hydraulic troubles.

The hydraulic circuit of a machine tool used in production is going to pick up or create within itself a certain amount of dirt regardless of the amount of care which is taken. Hydraulic housekeeping thus becomes a job of keeping this amount of dirt down to a minimum. Like some domestic housekeepers, those in charge of hydraulically operated or controlled machine tools often wait for dirt to accumulate and for troubles to start happening before they start to do any hydraulic housekeeping. A better method is to use preventive hydraulic housekeeping, and it is this method which really pays off in troublefree operation.

Among the best trained of all preventive hydraulic housekeepers are the graduates of the Henry Ford Trade School of Dearborn, Michigan. The fact that hydraulic circuits on machine tools in Ford Motor Company plants cause so few interruptions to production is no doubt a direct reflection upon the fine training which is given in the school, and the fact that the men in the shop understand the basic hydraulic principles. It would be well for others

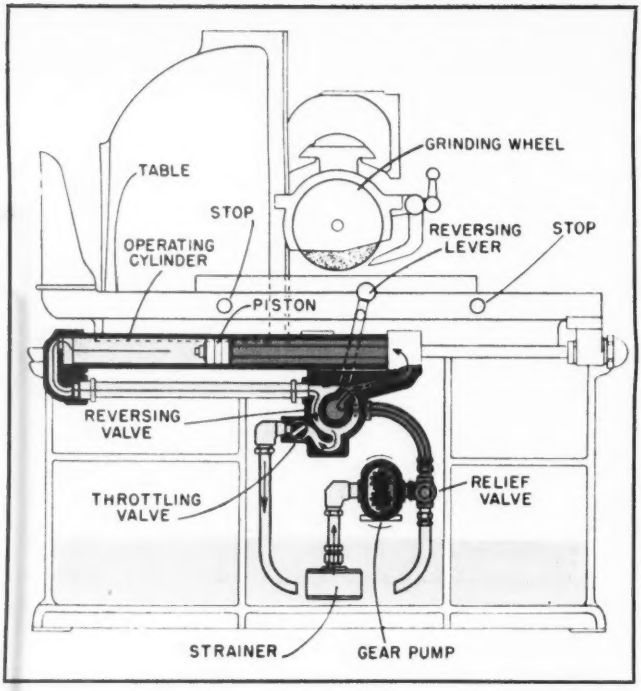


Diagram showing constant-volume hydraulic system of a surface grinder.

to learn the lessons which these men have learned.

Students at the school are taught to make certain that reservoirs, piping, fittings, pumps, and all other parts of a hydraulic circuit are as clean and free from dirt, scale, grit, waste, and lint as is possible within practical limits. This factor of cleanliness is applied to all hydraulic equipment, new or old, and at all times—during operation, following repairs, or prior to filling, refilling, or replenishing with oil.

Standard tank filling instructions which are given are to "use a very fine mesh strainer or cheese cloth" and pour the oil into the given tank or reservoir slowly. These instructions apply even to oil which is poured from sealed containers since drops of solder or bits of lint have been known to be disgorged while such containers were being emptied.

After the reservoir has been filled, the control valve is placed in a neutral position. The electrical control switch is worked on and off several times; and petcocks are opened in order to permit air to escape and then closed when "solid" oil emerges. Thus the system is filled with oil and purged of air without allowing the pump to reach full speed. After the system is filled, the oil level in the pump reservoir is checked again in order to make certain that the proper amount of oil is present.

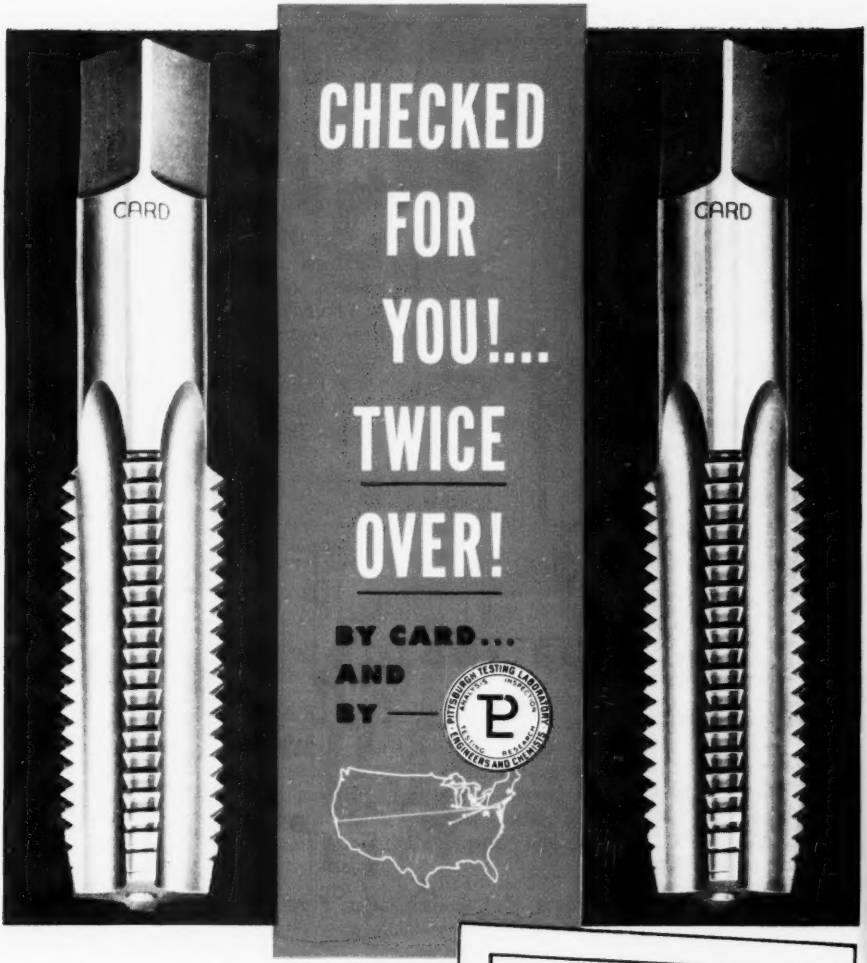
After providing for a proper amount of clean oil in a clean system, the next step in preventive hydraulic housekeeping is to keep the oil and the system reasonably clean. Air cleaners are placed in the breather openings if the air in the shop is at all dusty. Abrasive dust particles which enter the reservoir through the breather may create excessive wear in the moving parts of the hydraulic equipment; and this, in turn, may necessitate premature replacements. Air cleaners should be of a type which may be removed easily for cleaning, and this cleaning should be done at frequent and regular intervals.

It is taken for granted that oil filters are installed on hydraulic equipment in order to take out the greater part of any fine foreign matter that may be present in the oil. It is also assumed that there is a strainer or screen over the suction end of the inlet pipe in order to take out larger chunks that may be suspended in the reservoir oil. Specific examples of foreign matter which is and must be removed are as follows: dirt and chips from operating machines, filings from tubing, pieces of steel from threaded fittings, cast iron particles from hydraulic cylinders, threads from rags used to clean out the reservoir, and chips of paint.

The bits of foreign matter which are caught by a screen or filter usually stay there, and they gradually build up resistance to the flow of oil. A neglected screen or filter will eventually clog up and cause cavitation (the noisy implosion of vacuum bubbles inside the pump), erratic feed rate, loss of pressure, or complete failure of the pump to circulate oil. By applying preventive hydraulic housekeeping, oil is examined, drained, and removed if necessary at frequent and regular intervals; and similarly, screens and filters are removed, cleaned, and replaced.

The question now arises, "What is meant by frequent and regular intervals?" New installations are drained immediately after the first week of operation. This means the complete hydraulic system—piping, pump, cylinders, motors, and reservoir; and it also includes examination and cleaning of air cleaners and oil screens and filters, with renewal of elements if necessary. The oil tank or reservoir is also wiped out with clean, dry towels—never with waste. The hydraulic oil is inspected, and if it is found to be in good condition, it is re-used.

After the first draining, examination, and cleaning measures have been taken, the intervals for subsequent in-



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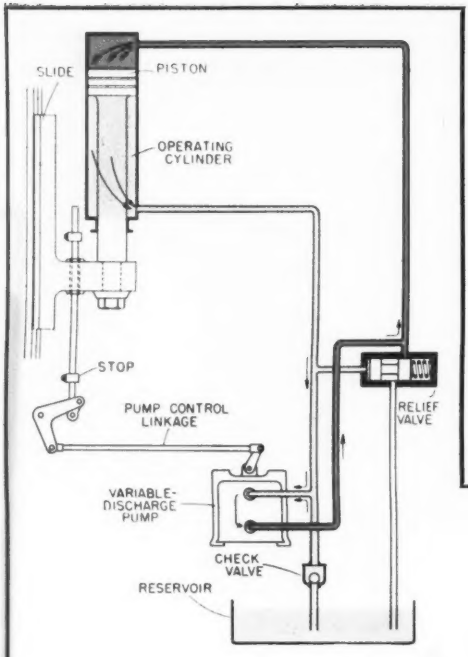
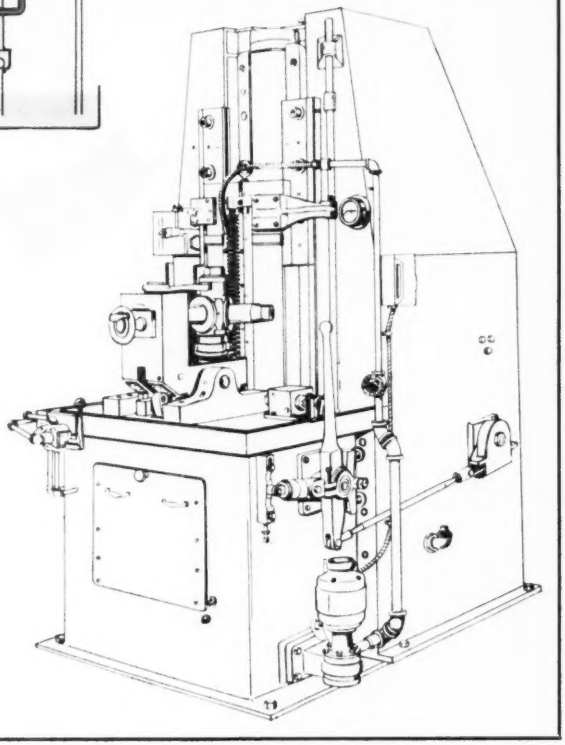


Simplified diagram of a variable-volume hydraulic system of a vertical broaching machine.

ed and the system is examined and cleaned, regardless of the appearance of the oil.

After the intermediate and scheduled drainings, the system is flushed; neither kerosene nor gasoline is ever used for the flushing, nor is any oil used other than that which is specified for normal operation of

spection are either two, four, or six months, depending upon the nature of service of the machine. In addition, the oil is examined approximately every two weeks, and if it appears to be dangerously dirty, it is changed; and the entire system is examined and cleaned. When the scheduled oil change time arrives, the oil is drain-



Sketch of hydraulic surface broaching machine.

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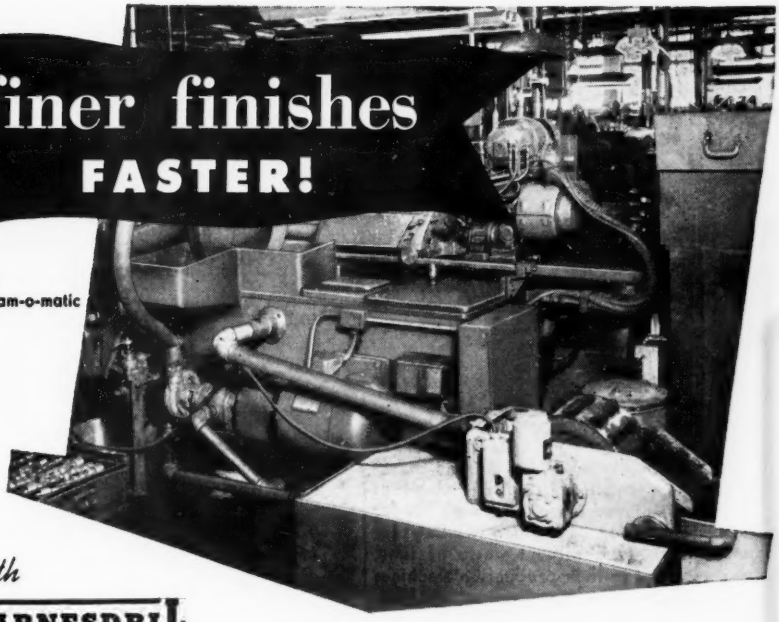

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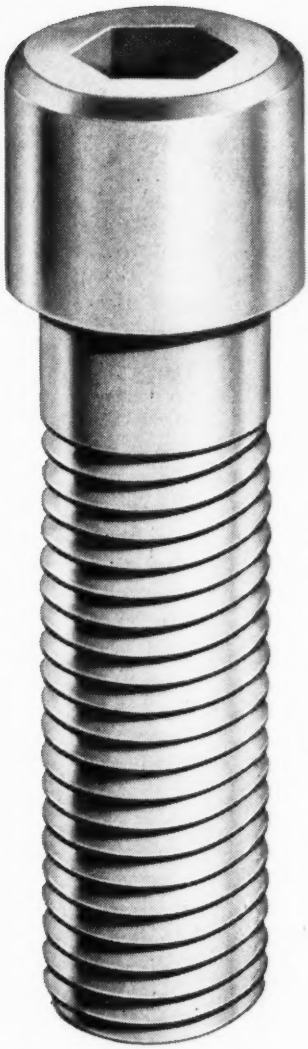
the circuit. This is done to make certain that the necessary lubrication of the pumping and control system will be maintained. It is believed that the use of flushing liquids other than the specified hydraulic oil may tend to adulterate the oil and lessen its ability to lubricate properly. This prohibition applies, even after six months of operation between drains. The theory maintained is that if the specified oil is kept clean within practical limits, there will not be any need for a gum-solvent or rust-inhibiting liquid flush. Hydraulic oil which is used for flushing is never used subsequently in a machine on production unless it has been reclaimed and purified.

There are, of course, several excellent flushing liquids for hydraulic systems, some of which exert valuable gum-solvent and rust-inhibiting actions. These liquids are used in many shops with complete satisfaction; and, as a matter of fact, they are often considered to be necessary. But it is nevertheless true that none of these flushing liquids has any great lubricating value, and that their use should always be followed by a thorough flushing with hydraulic oil. The hydraulic oil used for this flushing should not then be reused in a production machine until it has been purified, although it may be used in an "as is" condition for two or three subsequent flushings.

Extreme care should be taken to prevent any dirt or grit from entering a system while repair work is being done or adjustments made, or when gaging the contents of the reservoir. Except when it is absolutely necessary to use them, all holes or openings must remain covered in order to keep out chips or foreign matter from any source.

Although most people would not consider air to be dirt, it certainly does carry dirt and, in addition, water. Since even an absolutely dry, clean air, which is more of a laboratory curiosity



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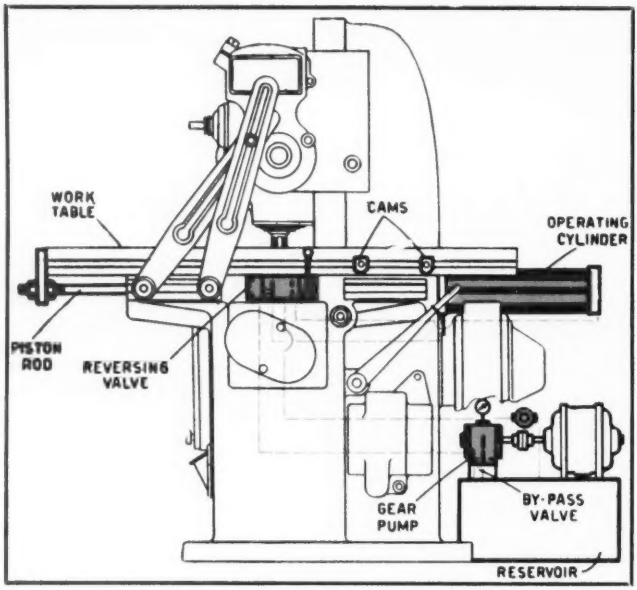


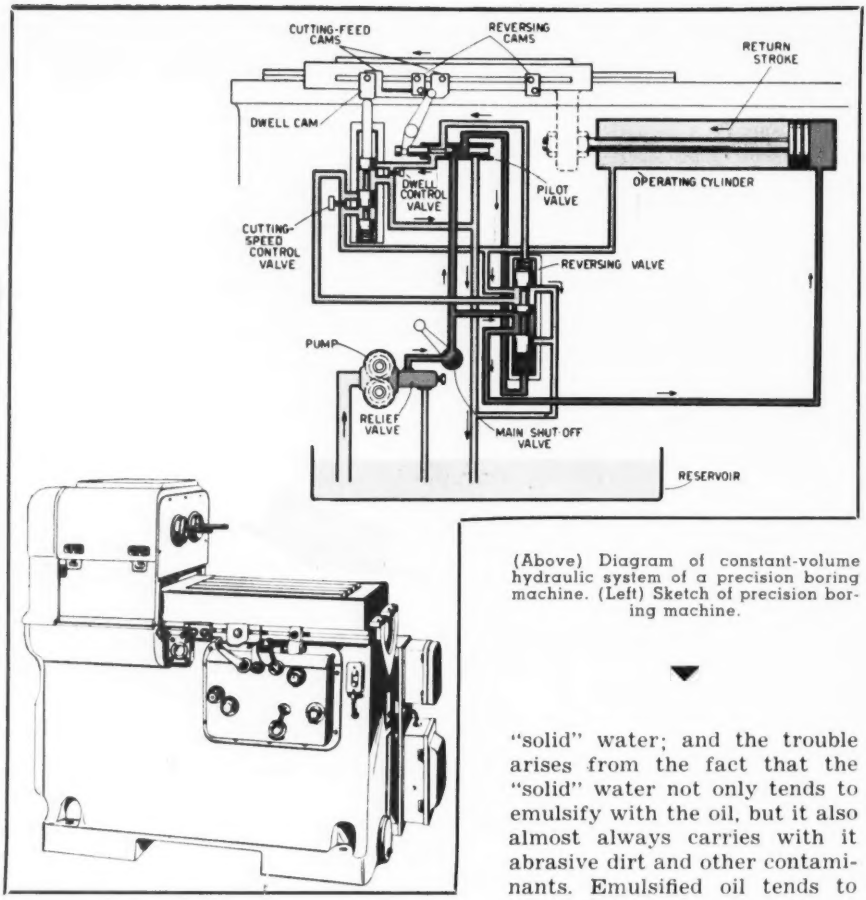
Simplified diagram of an hydraulic system of a milling machine.

than a common occurrence, can cause trouble, it is a good practice to keep any kind of air out of the oil—at least as much as is practically possible. Air is kept out of an hydraulic system by installing and using petcocks or automatic air drain valves in the highest points of the pipe lines. It is also advisable to check the joints of the inlet end of the system where it is possible for air to be sucked in if the fittings are not tight.

Some indications of air in the oil include noisy pumps, insufficient pressure, and erratic feed. In order to check these conditions, the workman should make certain that the intake pipe is well below the surface of the oil, that no air bubbles remain entrained in the oil in the reservoir (be sure that the oil releases air rapidly), that "solid" oil comes out of the petcocks in the high points of the piping when the pump is running, that air drain valves are operating properly, and that there are no leaks in the inlet line.

As for corrections for these conditions, the intake pipe is kept below the surface of the oil in the reservoir by simply adding more oil; air bubbles in the reservoir oil should all be released before the oil returned to the reservoir has passed the baffle (use an oil that de-foams fast); and since air may collect in the high points of a system when a machine is not in use, it is wise to open the petcocks and check the air drain valves. If a pump is noisy, and if it is certain that there is enough "solid" oil in the reservoir and that the high points of the system are filled with "solid" oil, it is suggested that the joints of the intake line be flooded with oil while the pump is running. Should the noise stop when a certain joint is flooded, the location of the air leak is revealed, and the condition is eliminated by tightening that joint. Insufficient pressure is sometimes caused by air bubbles reaching the relief valve, and erratic feed may be caused by the "cushioning" effect of air bubbles in the oil.

Practically speaking, a certain amount of air will always enter an hydraulic system; however, if air cleaners are used, and if the system is filled properly with a good grade of oil, most of the dirt will be caught by the air cleaner, the entrained or vaporous



(Above) Diagram of constant-volume hydraulic system of a precision boring machine. (Left) Sketch of precision boring machine.

water will not emulsify appreciably, and the oil entering the pump through a tight intake pipe will not contain enough air to cause any harm or to make any noise in the pump. With a reasonable amount of preventive hydraulic housekeeping, air and the dirt and water it carries will cause few hydraulic system troubles.

"Solid" water is another frequent and preventable cause of hydraulic trouble. Cutting and grinding liquids serve as the commonest sources for the "solid" water; and the trouble arises from the fact that the "solid" water not only tends to emulsify with the oil, but it also almost always carries with it abrasive dirt and other contaminants. Emulsified oil tends to lose its lubricating properties to a large extent; abrasive dirt wears out pump parts and control and other valves, and it makes such valves bind and stick; the other contaminants are likely to create both gum and sludge and thus also make pump parts and valves stick.

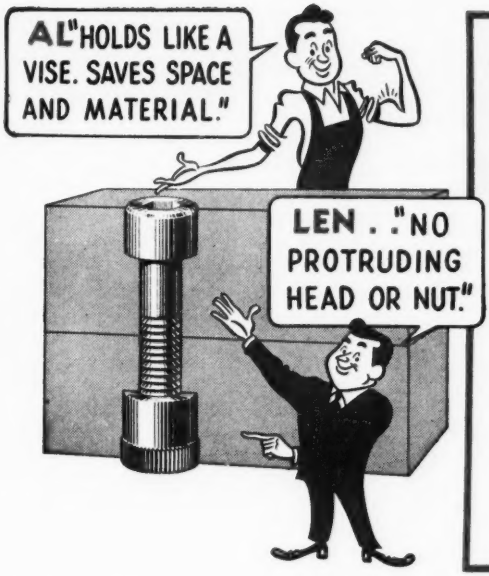
There is not much which can be done about worn parts except to remove them and replace them. Both gum and sludge may be cleaned off of sticking pump vanes and valves, but it is a better idea to keep the oil clean in the

first place. The amount of time devoted to finding out how such damaging "solid" water enters a system, and to closing all entrances, will prove to be time well spent. It will be found that the most common points of entry are tanks and reservoirs having unprotected openings into which cutting and grinding liquids may splash or drip.

On occasion, hydraulic oil will overheat, and this results in poor lubrication or pressure drops. Due to poor lubrication, excessive wear of moving parts is permitted; and, in turn, excessive leaking is caused by worn moving parts. The combination of abrasive dirt in the oil plus poor lubrication is one which is almost sure to create excessive variable leakage, the result of which is likely to be overheated oil accompanied by pressure drops.

It is an unsafe practice to attempt to raise the pressure by tightening either pump control springs or the relief valve spring; higher pressure will cause still higher oil temperature. It is a much wiser idea to find the cause for the pressure drop. Some of the causes of pressure drops with overheated oil include (in addition to worn moving parts, especially in the pump) leaking of the high pressure relief valve, clogged pipe lines, operating the pump at a higher-than-recommended pressure, overlong maintenance of pressure, having a reservoir which is not large enough to permit proper cooling of oil, improper positioning of the control valve, faulty or dull cutting tools, or misalignment or too-tight a ram. Clean oil seldom overheats.

While it is frequently recommended in literature on hydraulic oils and sys-



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tems that the oil be examined at frequent and regular intervals, one cannot tell much about an oil just by looking at it, except to note that it may or may not appear dirty. The following are considered to be better methods to obtain a true picture of the oil condition: feel around the bottom of the reservoir on both sides of the baffle for evidence of grit or sludge; look at the strainer on the intake pipe; examine the air cleaner and oil filter; listen to the pump; check the smoothness of the feed; and take the temperature of the oil in the reservoir. These are more reliable measures than merely using visual examination of the oil.

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Prepared by W. B. Cooley*

SUCCESSFUL heat treating may be accomplished quite readily with electric furnaces if practical equipment is used, if correct steels are selected for the products, and if established procedures are followed faithfully. A knowledge of metallurgy is not absolutely essential in order to perform heat treating operations although the knowledge is certainly desirable. Steel analyses and heat treating procedures are well establishd so that the required results may be obtained, and automatically controlled electric furnaces are available in order to supply correct and accurate temperature and heating conditions.

The following information, therefore, is presented in a practical way, devoid of metallurgical technicalities; and it is directed primarily to the shop man who may be unfamiliar with heat treating practice in general or with the use of an electric furnace.

A typical small electric furnace installation consists of a furnace proper, a controlling pyrometer (to hold automatically the furnace temperature at a desired set point), a fused line safety switch (usually furnished by the customer), and a two-compartment quenching tank (one compartment used to hold quenching oil and the other to hold water or brine). The tank is usually mounted on casters so that it may be easily moved to any desired position. A completely wired control panel with automatic multi-breaker line switch and pyrometer is sometimes furnished. The installation is ready for operation after two line wires are connected to the panel and a connector plug is joined.

An electric furnace is particularly suitable for heat treating operations because of its simplicity of operation and the ease with which an unskilled operator may secure consistently excellent results. By using such a furnace, the art of heat treating is reduced to a controllable process.

The only procedure that is required in order to place an electric furnace in operation is that of setting the pyrometer at the desired operating temperature and closing the line switch. The furnace is then energized, and the temperature is increased until the setting of the pyrometer is reached, after which the power is cut on and off automatically in order to hold the furnace at the desired temperature. When work having a widely varying cross section is to be heated, it is sometimes desirable to heat the piece more slowly than usual in order to equalize the heat in

*President, Cooley Electric Mfg. Co.

the part. The rate of heating may be controlled by manually setting a power modifier and limiting the power to the furnace in any desired proportion of from 5 to 100 per cent of full rating. This close control of rate of heating is also useful in cases where low temperatures are to be used, as in tempering.

Parts which may be heat treated in an electric furnace may be classified broadly into two groups—(1) tools and dies, and (2) production parts. The heat treatment of tools and dies will be discussed more thoroughly in this article since the data on this subject may be applied, generally, to production heat treating, and since the life and use of a tool or die depends so largely upon its heat treatment.

Definitions

At this point it would be well to define some of the terms which are used in this discussion.

Critical Temperature. When a steel is heated, there is a certain temperature, varying with the analysis, at which the carbon in the steel is combined in solution with the iron. This temperature is called the lower "critical" temperature and is the important temperature upon which all procedures in steel treating are based.

Hardening. This is the process of heating steel to a point above its "critical" temperature and then cooling with sufficient speed to develop hardness. Steels are cooled (quenched) in either air, oil, water, or brine. The heating temperature and the quenching medium are specified by the steel supplier. The actual hardness does not develop until the temperature of the steel has been reduced below 500 deg. F. whereupon the hardness increases until the temperature of the steel has approached room temperature.

Tempering (drawing). When a steel is quenched, a drastic rate of cooling

may set up internal strains which might cause breakage of the given part when it is in use. In order to overcome these strains, a tempering treatment may be applied. The hardened steel is re-heated to a temperature which is lower than the lower "critical" temperature and which is specified by the steel supplier, and then held at that temperature for an extended period of time. This operation tends to toughen the steel and cause some decrease in hardness; however, the benefits of extended tool life more than offset the undesirable reduction in hardness.

Normalizing (returning steel to normal conditions). When a tool is improperly hardened, or when a forging is to be heat treated, the steel in either case may be brought back to a normal or pre-transformed state by being heated to a temperature which is well above the "critical" and being slowly cooled in air.

Annealing. The process of softening steel by heating to a temperature which is slightly above the "critical" and then cooling very slowly is called annealing. Annealing is used in cases where good machinability is required and the steel to be used is too hard to be machined either after forging or hardening. Annealing may also be used to remove strains which may be developed in the steel by machining or hardening.

Types of Tool Steels. Tool steels may be classified broadly by the method of quenching used—water (or brine), oil, or air hardening or quenching steels. Since high speed steel is not included in this discussion, reference to it is made only as a separate type of tool steel.

Each type of tool steel has its own merits, and the selection of the type to be used for a given tool depends largely upon the use to which the tool is to be put. Sometimes the matter of

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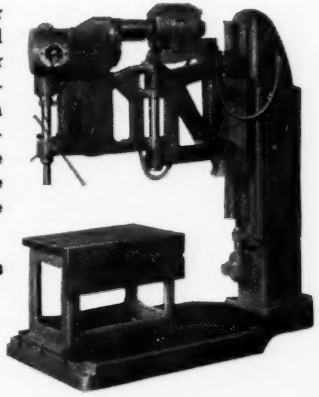

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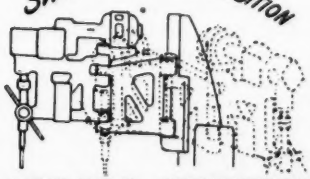

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the cost of either process or material is a factor which influences the selection. The various types of steels are made available by steel manufacturers so that a proper selection may be made in order to provide the best and most economical material for a given part.

By far the most widely used type of tool steel is a standard carbon steel of the water quenching type. This type of tool steel provides the three main requirements of a good tool steel—toughness, hardness, and wearing ability, combined with the economic factor of low initial cost and the factor of ease of heat treatment. These properties may be obtained in these steels to a degree which is satisfactory for many applications. In cases where unusual requirements must be met in any or all of these properties, it is suggested that alloy steels, oil quenching, and air hardening be used.

Tool steel manufacturers are well qualified to make recommendations concerning the specific steel to be used for a given job, but it is well for all jobs to be scrutinized carefully in order to determine whether water quenching steel may not be used satisfactorily. The following suggestions on applications are quite broad and should be used only as a general guide.

(1) Water quenching steel has a greater tendency to crack in hardening than does steel of the oil quenching type; therefore, if the tool design is such that cracking tendencies are suspected, oil quenching should be used. Water quenching steels are generally used for blacksmith tools; beading tools; burnishing, cold heading, and caulking tools; lathe centers; collets, impact tools; cutter for slow-cutting service such as pipe cutters; dies (check service required); drift pins; dowels; drills; fixtures; hammers; knives; mandrels; pins; punches; reamers; taps; wrenches; and so on.

(2) Oil quenching steels usually are desirable in cases where there is a tendency for the parts to become warped.

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Where close dimensions are to be held and grinding is not permissible or possible, oil quenching steels are preferable to water quenching steels. Tools generally made of oil quenching steels include arbors, broaches, bushings, cams, chuck jaws, collets, cutters, dies, fixtures, gages, hubs, molds, punches, reamers, rolls, spindles, stamps, taps, and so on.

(3) Air hardening steels are used in cases where the parts have strong tendencies to warp or where unusual requirements must be met. Some tools made from air quenching steels include broaches, dies, hubs, mandrels, punches, rolls, shanks, shear blades, and the like.

It is to be noted that many of the above applications overlap from one type of steel to another. The service required of a part governs the selection of the steel to be used, and careful analysis of service requirements really pays off.

Having selected the type of steel to be used for a given tool, consideration must next be given to the design of the tool. (Actually these two steps go hand in hand.) Often the heat treating equipment or the steel, or both, are blamed as being responsible for service failures when, actually, proper analysis would reveal that the tool was designed without due consideration of its response to heat treatment.

Failure of a steel, which is usually by cracking, occurs as a result of internal strains set up during manufacture, or during heat treating, or from external forces which are imposed in actual use. Usually, the external forces are held well within the specified limits if internal strains are kept to a minimum. Therefore, it is more important to consider the cause and cure of internal strains.

Internal strains develop largely during a quench because of the different temperatures which are present within

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the steel part. These temperature variations are mainly due to large differences in size and shape of the various sections of the workpiece. It is apparent, therefore, that the designer should try to design the piece so that all sections will cool as uniformly as possible. Of course, it is almost impossible to design a tool that could attain perfection in cooling uniformly. These several points should be watched, however — avoid large and small sections adjoining, but where such sections must be used together, eliminate sharp corners; use holes wherever possible in order to lighten heavy sections; and where cutouts unbalance the mass of a piece, cut out counterbalance sections if possible. The use of oil or air hardening steels is often substituted for water quenching steels when cracking tendencies are present.

(Editor's Note: Typical heat treating procedure and tips on better heat treating will be discussed in the next issue.)

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Producing Good Work in Inexpensive Dies

C. W. Hinman

The first of two articles in which the author offers suggestions on the design of low-cost dies.

By C. W. HINMAN
Designing Engineer

IT is quite evident that attention is being focused more and more upon cost-cutting methods. For example, the A.S.T.E. meeting which will be held during the week of April 10 in Philadelphia is featuring "Cost Cutting" as the theme of the Industrial Exposition held in conjunction with the meeting. In recognition of this effort to focus attention upon cost-cutting methods, we have prepared two articles on the subject of designing low-priced press tools. The first of these two articles is presented herewith and covers dies which are used in the production of small precision work

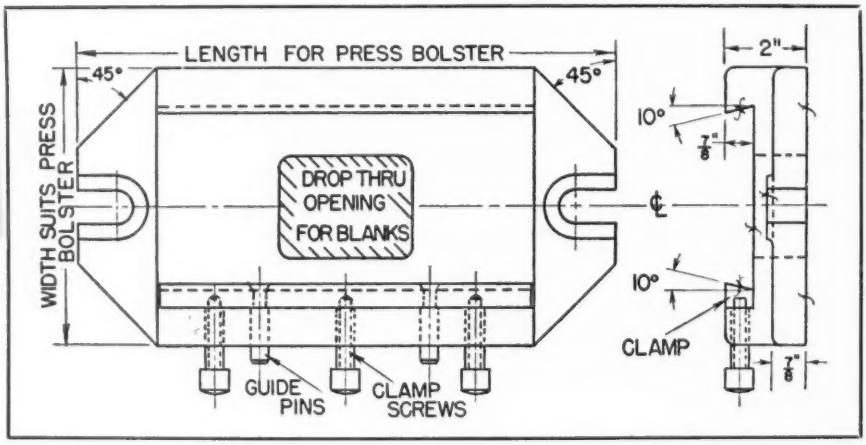


Fig. 1—Illustration showing design of adjustable die holder.

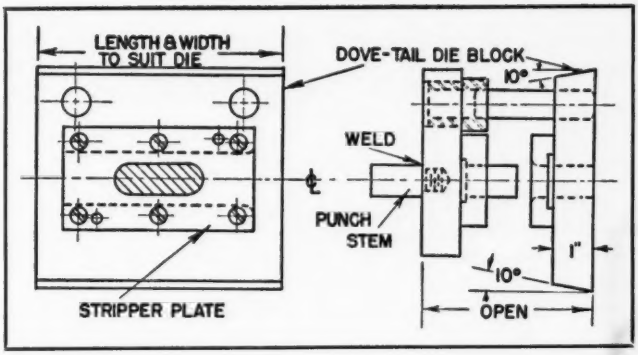


Fig. 2 — Illustration showing application of a dovetail die block.

such as parts for instrument assemblies, business machines, vending machines, and so on. The second article, scheduled for the February issue, will cover the design of dies which are used for the production of parts used in large assemblies where precision work is unnecessary, such as for agricultural machinery, automobile body parts, earth moving equipment, and so on.

When working on the design of a blanking die that will be scrapped after being used to produce only a few thousand parts, several cost-saving factors should be kept in mind. As in the design of first-class dies, the low-cost die should embody first-class workmanship and materials, but because of small production requirements should employ plain punch and die holders without guide posts and

bushings, plain flat pin stops, and die blocks of ½ inch or less in thickness, depending upon output requirements. Cutting members should be within sizes of plus or minus 0.005 inch and the die blocks should have ¾ to 1 degree clearance taper. Stripper plates are unnecessary for the reason that scrap neck cutters may be used to sever the neck between blanks for feeding ahead. The blanking punch and perforator should be short, and set in a machine-steel plate on the punch holder, or held in place with set-screws or other inexpensive means such as Cerromatrix Metal.*

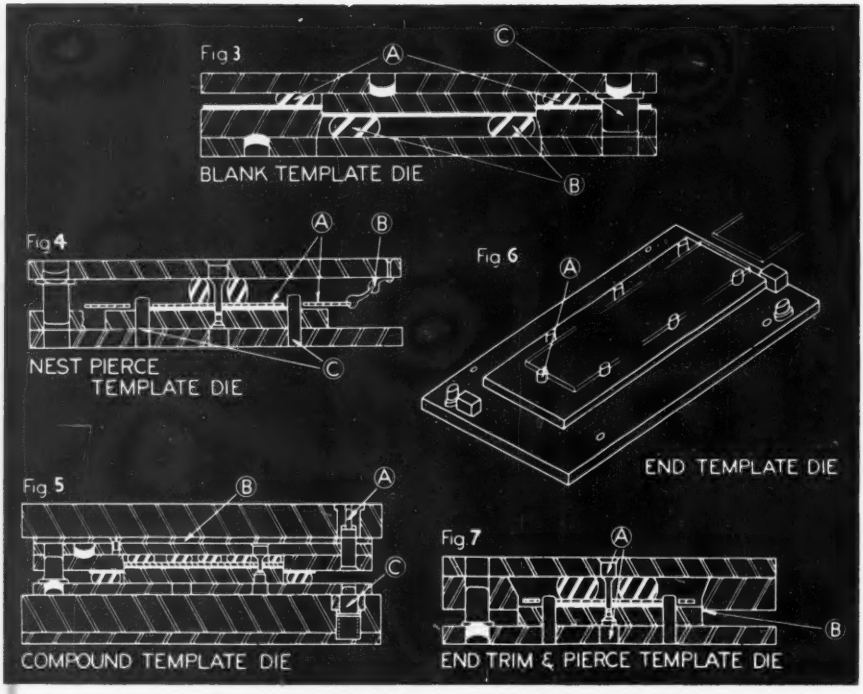
The blanks which are produced in the low-cost die should have fairly smooth edges. The general appearance of the die is unimportant, and refinements are unnecessary. Machine finishing of the die is required only where a close fit must be made.

Dies which are built in accordance with these suggestions will cost 60 per cent less than the so-called first-class dies, and will produce workpieces that are practically as good as those produced in first-class dies. If burrs appear on the edges of the blanks, the blanks may be "tumbled" to remove the burrs and rough edges. If a certain portion of the blanks must be held within precision tolerance, a number of blanks may be stacked in a milling machine vise for simultaneously milling them to the required precision measurement. Precision milling is often required even when the blanks are cut in first-class dies.

Dovetail Die Blocks

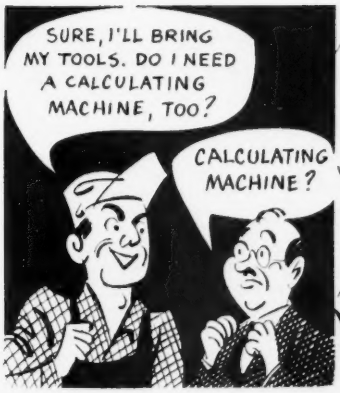
Inexpensive dovetail die blocks are frequently specified for use with small dies because of the advantage of low tool cost. Fig. 1 shows an application of an adjustable die holder which is of

** For information on this metal, address: Cerro de Pasco Copper Corporation, 40 Wall Street, New York 5, New York.*



Illustrations showing application of the "template" method in building inexpensive dies. *(Illustration courtesy Algoma Products Company)*

universal design. The die holder is cast of semi-steel and is machine finished only on the few surfaces indicated by **f.** When inexpensive and efficient press tool equipment is desired, this die holder together with its corresponding die, shown in Fig. 2, is a very satisfactory design. For even less expensive equipment, the guide posts and guide bushings may be omitted from the die. Only a few different sizes of die holders of this type are required to accommodate



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many different widths, lengths, and types of dies.

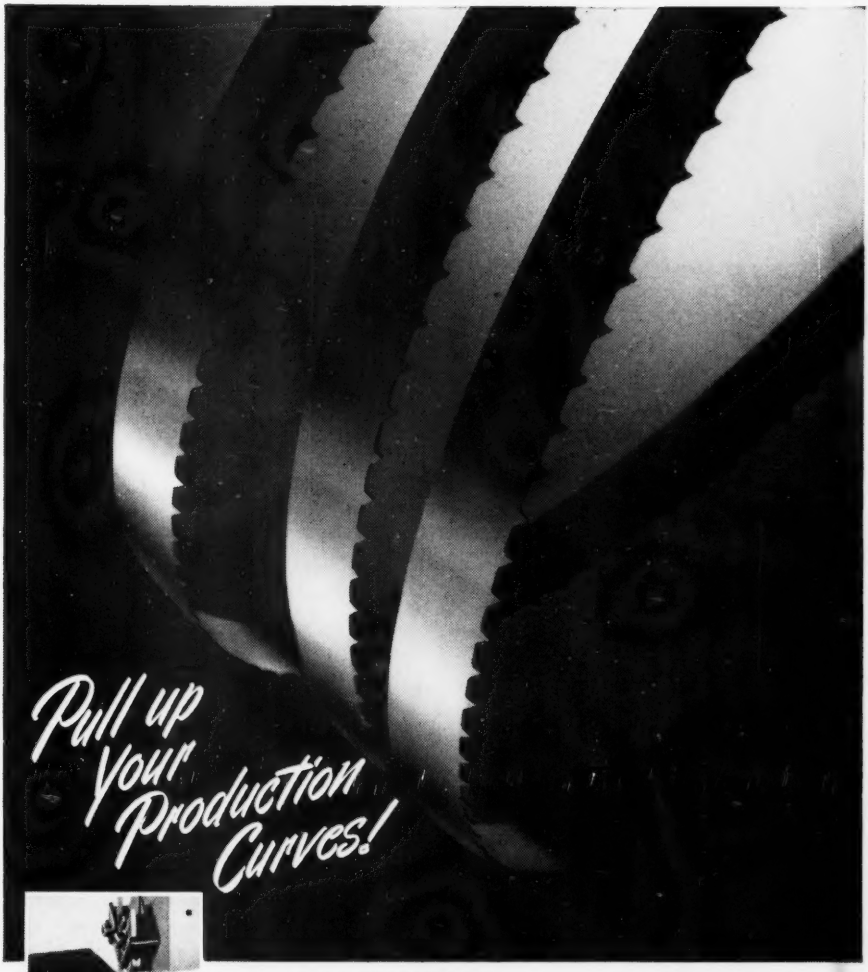
An inspection of the simple sketches shown reveals that it is obviously a simple procedure to set up these dies in a press. The die holder is permanently fastened to the press bolster plate in readiness to take any type of die which has dovetailed edges. After clamping the die block in the holder, the latter may be adjusted slightly in order to connect the punch stem centrally under the press ram.

In operation, the die is fed in the same manner as a conventional die set and all other conditions are practically the same even though no regular die set is used. The quality of the work produced in dies mounted on dovetailed blocks compares favorably with that of any other type of die used in any other press.

The dovetailed die block system is especially desirable for use by small manufacturers since it reduces by a considerable amount the usual high cost involved in small-lot orders. The press tool is of light weight and is easy to construct and handle. Ordinarily, only three widths of dovetail-shaped toolsteel die block sections will be required for each press size. The several cross-section widths are machine finished in two or three foot lengths on a planer and then stocked. The stockkeeper may easily cut off any desired length for making a new die block. Dovetailed die blocks require only a minimum amount of storage space. Actually, only about one-half of the tool vault space is required as compared with the space required for dies mounted in conventional die sets.

Template Dies

Figures 3, 4, 5, 6, 7, and 8 illustrate a new low-priced system for constructing all types of dies. The idea for this system was developed recently by Algoma Products Company. This die



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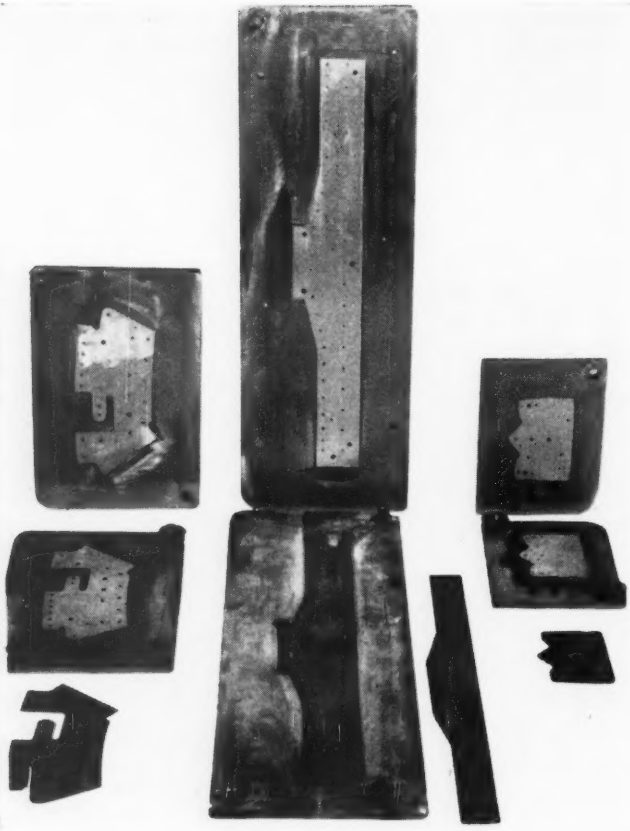


Fig. 8 — Reproduced photograph showing three blanks beside their respective template dies.

(Illustration courtesy Algoma Products Company)

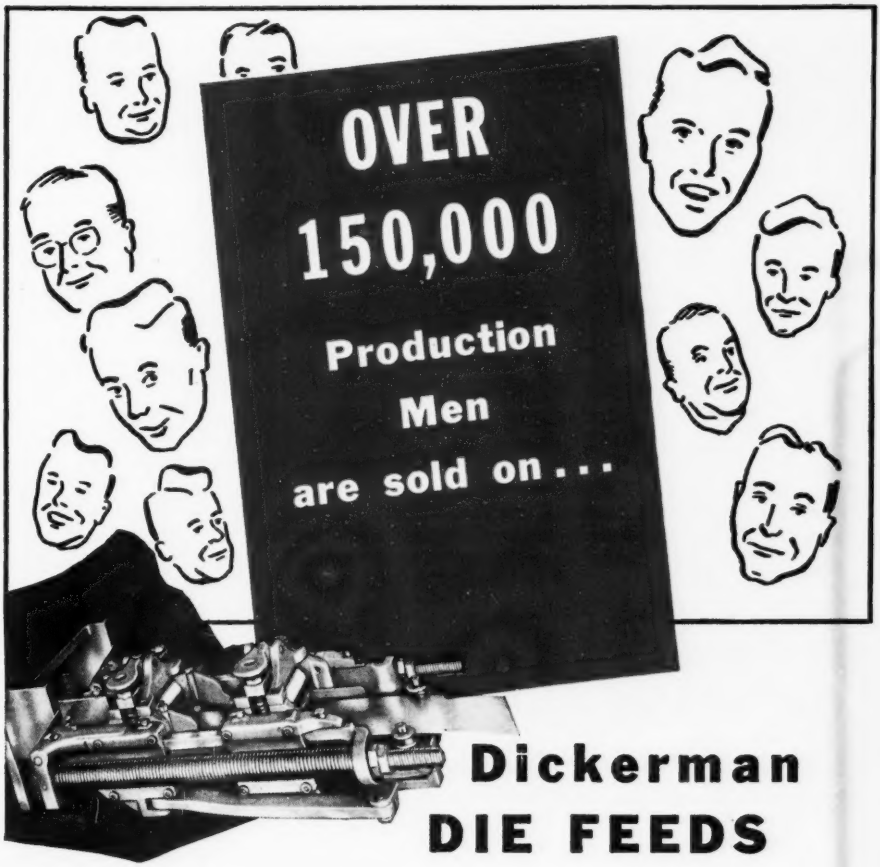
making process can be used in blanking, perforating, piercing, and forming hundreds of different parts in any press room. Compared with conventional methods, this process has reduced die costs in many cases about 65 per cent and the time for assembling and trying out the completed press tool, about 75 per cent.

In this "template die method" the dies are built from templates of the workpiece itself. Obviously, this procedure eliminates the need for a special die design, the necessity for tool drawings, and the slow expensive machining operations usually employed to fabricate the die parts. By means of this simple scheme of press tool construction, the problem of subsequent alterations in dies due to engineer's changes is practically solved.

The die opening contour is "band sawed" through a die block of chrome molybdenum steel, filed, sheared to size by using the punch, then hardened, and assembled by welding on inexpensive backing-up plates. Thus, about one-third of the critical alloy steels, formerly required in all conventional dies, are eliminated. Replaceable piercing punches, of hard drawn tool steel, may be used for piercing any reasonable number of small holes in the work.

Blocks of soft rubber for stripping are employed as shown at **A** in Fig. 3. Other soft rubber blocks as at **B**, are used for ejecting blanks from the die. Alignment guide pins **C** of different diameters are used to prevent incorrect assembly of the die plates.

At **A** in Fig. 4, a thin aluminum plate is employed to equalize the stripping pressure; it is equipped with the at-



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tached chain supports shown at **B**. Inserted work-holding pins are provided as shown at **C**.

In Fig. 5, guide cap-screws are provided as shown at **A**. Spring supported pins at **C** permit slugs to be blown off when the die opens. A separate plate **B** is employed for backing up the punches in larger dies.

The stop pin **A** in Fig. 6 is used for gauging when making an end cut. The work strip is guided between six pins, three on each side.

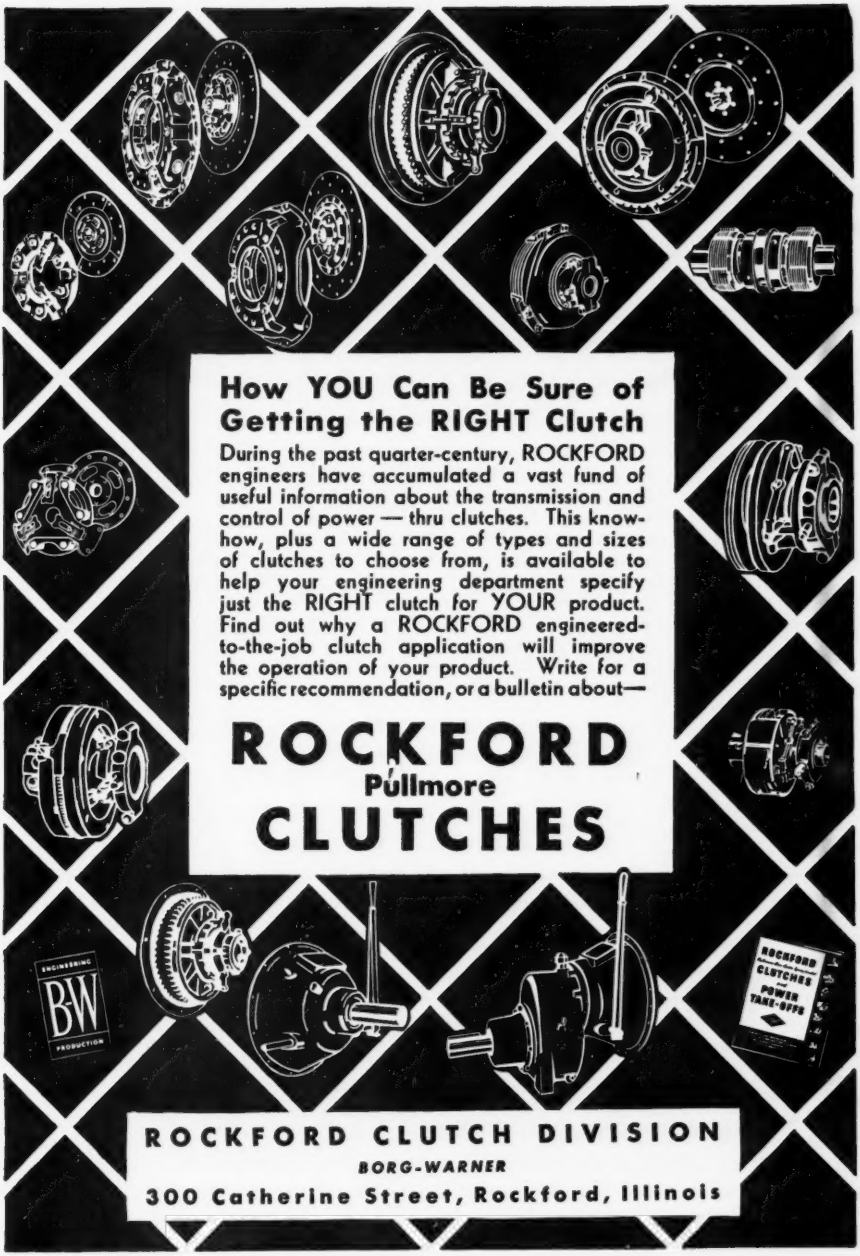
Piercing is performed in the compound end trimming die shown in Fig. 7 by simply inserting piercing punches **A** in the punch plate, and by providing corresponding die holes underneath them. Punches **A** are surrounded by a soft rubber block which strips off the work sheet on the up-stroke. This type of die is designed to handle either strip or sheet stock.

The complete die assembly can be installed in a commercial die set, or on a press bolster plate that will provide the proper shut height for the die. Two mounting holes in each back-up plate are held to fixed locations with vertical pins in the die shoes. Thus, any of the dies may be interchanged and used in any one of the die sets.

The dies may be designed as single, compound, or progressive type, and are suitable for blanking, piercing forming, or light draws. For progressive dies, the work strip is guided between a nest of removable gauge pins which are inserted in the die face, as shown in Fig. 6.

Figure 8 is a reproduced photograph in which three different blanks are shown beside their respective template dies. These typical light gauge perforated blanks are just a few of the hundreds of different shapes of small parts that are now being fabricated in the template type of die.

It is not always economical to attempt tooling and running your own lots of small orders for blanks. There are a score of reliable specialists in this field who are well prepared with special die setups and many years of experience in this line of work. These companies should be given an opportunity to quote prices for making a hundred or several hundred blanks, perforated and formed. Send them your prints of the work, and gauges or specifications as to tolerances. Addresses of some of these specialists will be found in the advertising pages of MODERN MACHINE SHOP.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Karl F. Kirchhofer

Sales Hints for the Smaller Shop

Practical suggestions for the man who wants to start his own metal-working shop.

By KARL F. KIRCHHOFER

PREVIOUS articles in this series on the subject of sales hints have dealt largely with the problems which concern the already-established, smaller metal-working plant. This month, let us cite a few case histories of how and why shop executives who are connected with large, highly successful, and well-known plants happen to go into business for themselves, and what they do to achieve success entirely on their own.

There are few individuals indeed who do not secretly nurture within themselves the dream of, "a business of my own"; and there are fewer of them who thoroughly understand the pitfalls and the difficulties which they will encounter before they are firmly launched on the highway of success. The following are a few sales hints for the man who wants to start his own small metal-working shop.

Not long ago, a highly skilled technician was employed in the service and repair department of a well-known company whose products are used in the aviation and instrument industries. His job was that of dynamically balancing high speed rotors in aircraft. During the course of reconditioning a directional gyro rotor, the man thought again and again of how much less he could afford to charge for the job if he could perform the work on his own time, in his own shop, and without the enormous overhead which automatically had to be figured into every job that was turned out in the large organization.

In his spare time he built much of the equipment which is required for dynamic balancing jobs, and with his savings he purchased other machines and tools. He then approached the management of the company for which he worked with his plan. They offered no objection to his program, and a few weeks later he was in business for himself. He made personal calls on key men of the leading airline companies, and soon he was established in a small shop out in the country with two employees and all of the business that he could handle. With the aid of a creative printer, he brought out a four page folder explaining his service and stating that, "the tendency toward higher speeds in practically all industries concerned with rotary parts demands increased perfection in dynamic balancing."

Now here is a highly specialized business concerned with supersensitive dynamic balancing that has succeeded, thus far in a modest way, because there was a NEED and a DEMAND and a MARKET for this type of service, and because the specialist could turn out the work at a price which was considerably less than the cost to the airline companies of having the work done in their own plants. Backed by various types of publicity, trade journal advertising, direct mail, and other tools of industrial marketing, the future of this man's business appears to be assured; and thus another man who has "gone into business for himself" is on his way.

Another example may be seen in the case of an expert Swiss-type automatic screw machine set-up man and operator who was working for a watch manufacturer. He bought two automatic screw machines on credit and then canvassed, in his own area, all known users of precision parts which were produced on automatics. He soon had more than enough work for his two machines; and today, just a few years later, he operates a shop specializing in small precision parts which are used for fountain pens, instruments, and a variety of products.

In order to show how numerous the opportunities are for going into business for yourself, it might be interesting to note that one of the employees at the plant producing precision parts soon branched out for himself by installing two automatics in the basement of his home; and there, because of lack of overhead, he is able to compete with practically anyone in the field. In still another instance, the plant superintendent of a well-known manufacturing concern, who had many years of experience in the making of intricate dies, opened a small shop with only a few machine tools. He now makes parts, dies, tools, and fixtures, many for the plant with which he was formerly connected, at a lower cost to

the manufacturers and at a profit to himself.

There are many important factors to be considered before going into business in a small way for yourself. Is there a need, and is there a market for your product and/or service? Have you a sufficient number of personal contacts among plant officials who will give you opportunities of quoting on work? Are you adequately financed so that you can operate for a considerable period of time on a modest amount of business and on a comparatively small income. Have you the experience and know-how, the technical and the engineering background, and the intimate knowledge of machine tools and what they will do, that are required? Are you willing and able to put in many more hours on the job than are now necessary in the secure position, built up by years of seniority with your company, that you now enjoy?

Remember that when you leave a job of works manager, chief inspector, plant superintendent, or toolroom foreman in order to venture out on your own, you are frequently burning your bridges behind you. Once you sever your connections, you seldom have an opportunity of picking up the pieces again. For while you are out trying to succeed on your own, the company for which you worked has replaced you, perhaps with a younger man and one who will do the job as well as you did and for less money.

It takes courage, self-confidence, wide experience, and knowledge to abandon the security of a known weekly pay check for the uncertain profits of your own business and for, very likely, no take-home pay for weeks on end. But America has always been known as the land of opportunity; and as long as there are hard-working, hard-saving toolmakers and machinists who have ideas and imagination, you will still find hundreds of them opening new businesses or taking over unsuccessful ones, each of these men with the strong belief and conviction that he will succeed.

Needless to say, the rewards of running a successful business of your own are numerous—independence, a good living, no fear of the big boss' whims, and no danger of being fired (a very important factor and one which is magnified in importance whenever a new management takes over a big business). When and if you do decide to open your own business, no matter in what phase of the metal-working industry it may be, obtain the aid of an experienced sales promotion, advertising, and publicity man, and the services of a reliable industrial advertising agent. Oftentimes, it is the sales campaign and the creative thinking behind it which will determine the difference between success and failure of your enterprise. Investment in sales counsel is a type of business insurance, and the wise small machine shop owner will seek it out and use it to advantage.


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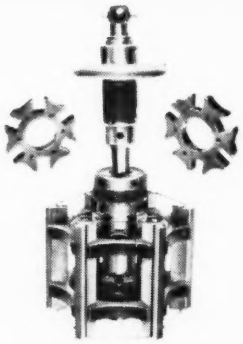

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Mechanizing Quality Control

In which the author describes "banding" of indicators and a "two out of three" system.

By Clifford W. Kennedy

WHENEVER workpieces are carved out of metal, whether in lathe, screw machine, grinder, boring machine, miller, or whatever, some proportion of the pieces seem bound to come out either over tolerance or under. Yet, with the use of certain newly developed quality control techniques available, the customary amounts of scrap and rework which impair average machine production are ridiculously unnecessary.

Though the proper application of quality control will hold outsize work down to under 1 per cent of total output it isn't necessary to explore all the mathematics, theory and philosophy of statistical quality control. The mathematician has done his work well and reduced the necessary information to tables or, at least, to simple formulas. Certainly statistical methods are no harder on the mechanic than the use of a sine bar or trig tables. In fact, quality control limits can be put on gages and instruments used at machines in such a manner that, with proper use, no scrap at all need be made. It is necessary, however, to get rid of some traditional conceptions in connection with machining capabilities, settings, measuring methods and tolerances.

No machine operation, of course, is capable of producing pieces exactly alike dimensionally. Duplication, in other words, is impossible. Any machine has a range, so-called, an inherent range of variation brought about by a legion of conditions: type of material, condition of tool or wheel, worn bearings and ways, vibration, cutting speeds, action of chucks or centers, to say nothing of tool setting, indexing or direct operator influence.

The conception of machine range or variability can be illustrated, as it is in Figure 1, by measuring a selected dimension on a succession of, say, twenty pieces as they drop from the machine. The actual diameter dimensions of such a group of work appear graphically in Figure 1 as if a chart record had been kept of them. The blue print for this particular work prescribed tolerances of $\pm$ .001 inch.

The indicator reading of the diameter of the first piece of the twenty shows at the top of Figure 1 (marked by a dot) as plus .0002 inch. The succession of dots below diagram the series of similar indicator readings for the other nineteen pieces in a row as the lathe made the cut and the measurements were taken.

During this short period the operator made no change of setting or indexing nor was the tool sharpened. So

the chart of Figure 1 really portrays the natural variations in diameters produced by the existing condition of the machine, material and tool—conditions or variations over which, to a very considerable extent, the operator has little or no control.

While the measurements diagrammed in Figure 1 show the machine setting nominally at a few tenths below the mean, the work will soon get over on the high or plus side, from normal tool wear, as indicated in the chart of Figure 2.

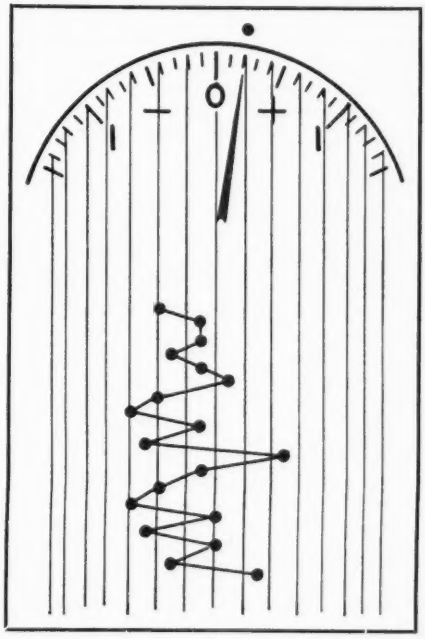

Fig. 1—Graph illustrating the idea of machine range or variability.

Most operators, too, deliberately work on the high side and a picture of their work would more normally look more like Figure 2 than Figure 1. An operator does this because subconsciously he realizes that oversize pieces could be reworked but he can't do a thing about undersize parts.

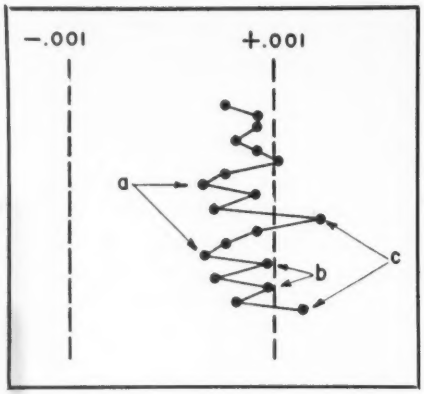

Fig. 2—The measurements charted here provide an indication of normal tool wear.

Now comes the meat of the situation. Traditionally, the operator measures one piece every so often in order to check his setting. In many shops this control is rigidly bracketed in his operation cycle which requires him to measure, say, every tenth piece or to check on the dimension of one piece every ten minutes, or something like that. If he measures more pieces or indexes the tool more often than the exact time and motion standard prescribes, he fails to make as many pieces and his pay envelope suffers.

In picking up the one piece to be measured, in accordance with his time cycle, one of three things may happen. If that piece happens to be of the size of **a**, Figure 2, there's no worry. If the one piece checked happens to be in the **c** group he will usually be alarmed at oversize work and reindex his machine.

But he may happen to get one of the **b** group (the diameter of which would still go in his fixed snap gage). He sees that, while the work is right at top tolerance, it is not oversize and he lets the machine run on.

What the time and motion engineer forgets, in establishing a gaging cycle, is that the machine itself produces variations, that it has an inherent range, and also that a stipulated selection of a single piece for a tolerance check based solely on some regular time interval may come up with an **a** size piece (Figure 2) or even a **b** size piece. Even so the machine is simultaneously producing the oversize **c** pieces. The operator and toolsetter forget almost exactly the same thing and ignore the fact that, though the work they happen to measure has not actually gone over tolerance as at **b**, Figure 2, there is still bound to be oversize work in the batch.

Where the machine happens to have a widespread inherent range of variation the operator soon discovers he is getting an excess of oversize pieces. Usually then he clamors for more tolerance. So, engineering yields and the tolerances are doubled. But the operator persists, traditionally and habitually, in keeping at the high tolerance. The paradox appears in the diagram of Figure 3 where the tolerances have been doubled from ±.001 inch to ±.002 inch. Widening the tolerance usually has no effect in the end because the operator inevitably gets over to the high tolerance eventually, the pieces he happens to measure still fit

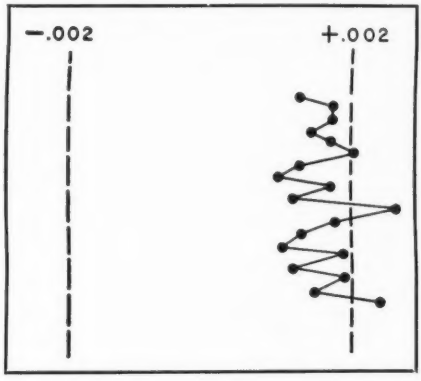

Fig. 3—Illustration showing that widening of tolerance has little effect on reduction of oversize workpieces.

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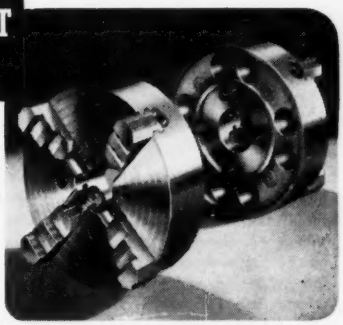

Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4 ½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.

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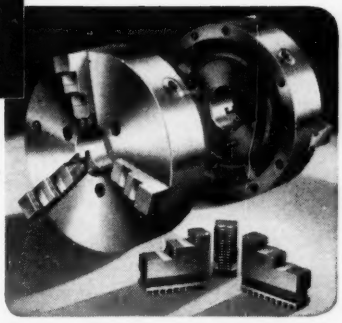

Self-centering models for light, medium and heavy duty jobs in tool room or for production runs. Available in sizes from 3" to 21" with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled.

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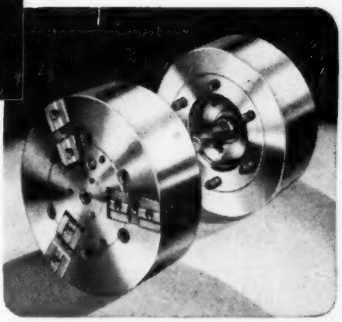

Self-centering models for heavy duty production work on engine and turret lathes and automatics machines. Sizes from 6" to 21" with forged steel bodies, and with either 2 or 3 non-adjustable jaws are available. The wedge angle is such that work is gripped positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar. Skinner also has a complete line of power chucking accessories.

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his snap gage, and there is still oversize work, all as Figure 3 points out.

One obvious answer to the dilemma is to artificially narrow the tolerances. Many design engineers cut a required or sensible tolerance in half on the cynical premise that half of production will be out of tolerance anyway

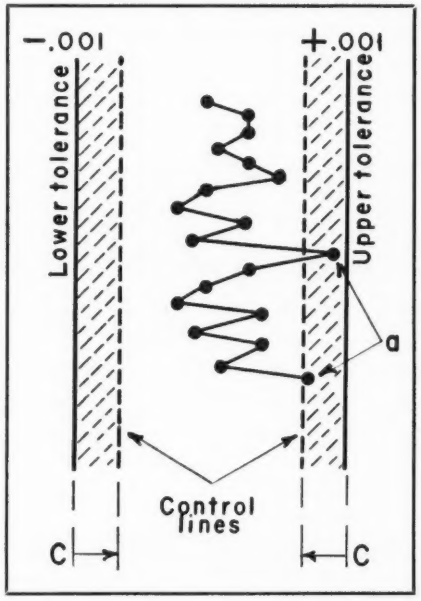

Fig. 4—Illustration showing method of artificially narrowing tolerances.

and only by so doing will they come out with the desired fits at assembly that they originally wanted. A few department managers will mark over blue print tolerances cutting, say, a $\pm$.002 inch tolerance to $\pm$.0015 inch or even to $\pm$.001 inch for the operator.

To a degree, the quality control engineer does the same thing, but more scientifically perhaps. Figure 4 illustrates his principle, applied to the same machine and batch previously illustrated. "Control" lines or zones

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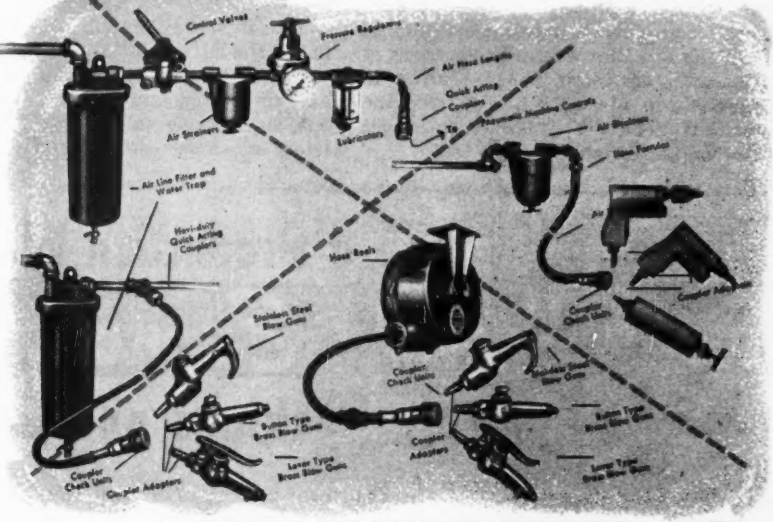

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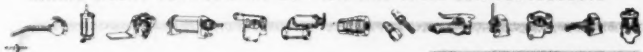

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TABLE I

Tolerance Spread	C value
.0005"	.00008"
.001	.00016
.002	.00032
.003	.0005
.004	.0006
.005	.0008
.006	.001
.008	.0012
.010	.0016

are added and the mechanics of the situation is then altered by the following prescription. If or when, in the course of the production cycle, pieces of the size of **a**, Figure 4, are detected, even though they are not oversize nor even quite up to tolerance,—when, in other words, his work has entered the warning zone—it is time to reset, reindex, and/or sharpen the tool.

The warning zone or control limits are less than the tolerance limits by an amount "C", Figure 4, and the correct mathematical C values are given in Table 1 for the common tolerance spreads. (By tolerance spread is meant the total tolerance. The tolerance spread for ±.001 inch, for instance, is .002 inch. The tolerance spread for blue print figures of +.000 —.002 inch is .002 inch).

In other words, under this control system, where the blue print calls for ±.001 inch, when a check piece that measures more than +.0007 inch is discovered, it is time to take warning —it is safer then to readjust the machine. If the mechanic waits until he finds work measuring fully up to +.001 inch he has already contaminated the batch with oversize pieces.

The same principle applies of course at reindexing and setting up to the low side of the tolerance. Where test work measures smaller than —.0007

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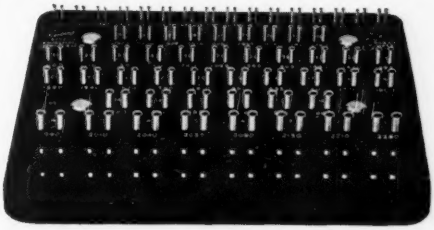

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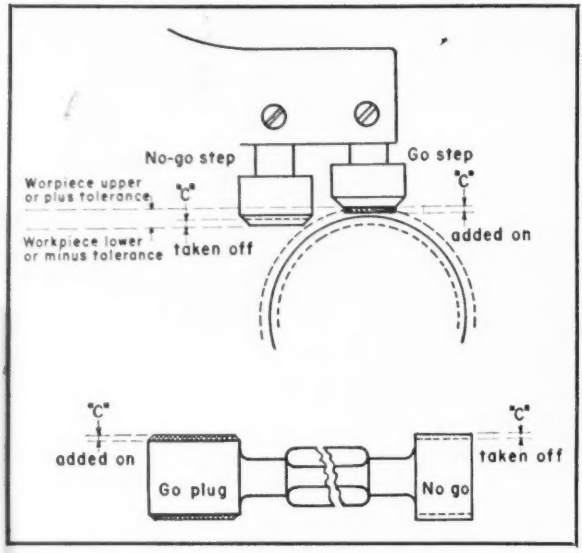

Fig. 5 — Illustration showing methods of narrowing tolerance spread.

inch (in this example) it is a good warning that the setting is too close to the jumping off place into scrap.

A very practical use of the **C** values in Table I can be made either by chrome plating the jaws of fixed snap gages—building them up and narrowing the gap—as shown in Figure 5, or by setting the go anvils of adjustable snap gages not to the blue print tolerances but to the tolerances minus the **C** value for that particular tolerance spread. (The no-go anvils are either lapped back or adjusted by the **"C"** modification as Figure 5 also indicates.) In a similar fashion, the diameters of no-go ends of plug gages are ground or lapped down a few tenths, by an amount equal to 2 x **C** for the particular tolerance spread. (The go plug is similarly built up, usually by chrome plating, by 2 x **C**).

An indicating gage can be "protected" in the same manner either by shading control or warning zones in on the indicator dial (usually with red pencil) or by cutting out little wedges of colored Scotch tape and sticking them on the indicator crystal to accomplish the result illustrated in Figure 6. (If an indicator is equipped with so-called tolerance hands or masks, they can be set to tolerance minus **"C"**).

The **C** values appearing in Table I are based on a certain set of quality control mathematics by which the correct or limiting range of variation inherent in a machine can be calculated for any particular tolerance spread.* In other words, if a machine is to produce within certain tolerances, its inherent range of variation cannot safely exceed a certain number of thousandths of an inch. Where, for instance, gages have been modified by the proper **"C"** protection and where in spite of all efforts at reindexing, resetting, sharpening tools, and so on, outsize work persists, it is a conclusive sign that the machine needs overhauling, increased tolerances are justly demanded, perhaps, or the operation needs possibly to be done in another type of machine. A drilling, reaming or boring operation, for example, might be switched over to broaching or honing in order to secure the necessary size control. Many times a change in

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** Study of this philosophy can be started in simple fashion in the "Dimensional Quality Control Primer" issued by the Federal Products Corporation, 1144 Eddy St., Providence, R. I., or from the author's book: Quality Control Methods, Prentice Hall, New York. Both contain bibliographies of books that delve even farther into the statistical principles and theories involved.*

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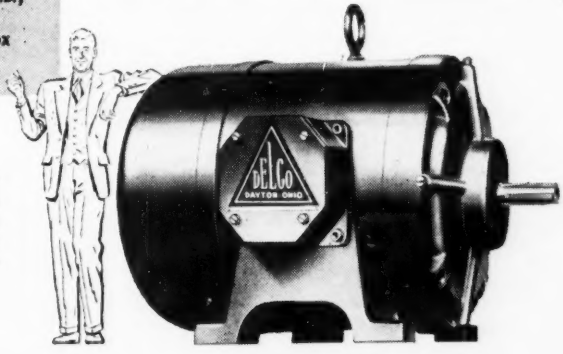

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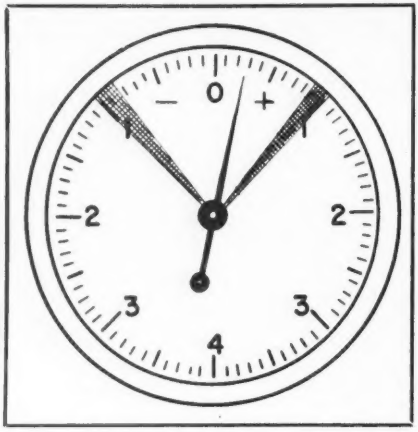

Fig. 6—Illustration showing "protected" indicating gage.

the type of tooling, or the kind of material, or buying a new chuck effects the results desired.

At all odds, where the operator is to check only one piece at a time, at more or less stated intervals, he can be about 90 per cent sure that his production contains no oversize or undersize work if he uses "C" modified gages or takes action when his normal measurements show the dimensions he is working to have entered the warning zone.

Another system of mechanized quality control similar in appearance to the "C" protection zone system described above is also suggested in the "banding" of an indicator as shown in Figure 6. It has the advantage, if arrangements will be made to follow it, of making 99 44/100 per cent certain that no scrap or rework will contaminate the machine production so far as the control of any single dimension is concerned.

This time the gage indicator control zones are marked in, following the "A" values in the Table II.

Comparing the A values in Table II

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TABLE II

Tolerance Spread	A values
.0005"	.00014"
.001	.0003
.002	.0006
.003	.0009
.004	.0011
.005	.0014
.006	.0017
.008	.0023
.010	.0029

with the **C** values in Table I, it will be seen that the **A** value is consistently greater than the corresponding **C** value for each tolerance spread. At first glance it looks like a further constriction of available tolerance spread. But now, however, one of the most powerful and sensitive statistical quality control techniques is to be followed: that of controlling the size of work by **averages.**

Under this system the operator measures the relevant dimension on 3 pieces at a time. If the indicated measurements of 2 out of the 3 appear between the warning bands **A** and **A**, Figure 7,—if the indicator hand, in other words, falls in the "white wedge" at least 2 out of 3 times, even though the indicator hand swings into one of the **A** warning zones for the third measurement—the operator can be 99 44/100 per cent sure the work being put out in the interval represented by his sample of 3 pieces is all inside tolerances.*

If 2 out of 3 measurements, or all 3 of the sample, show in one of the "A"

** The fact that a determination is based on the locations of 2 readings out of 3 has very much the effect of an empirical calculation of the actual arithmetical average of 3 readings, or of getting the median value. The "A" controls (Table II and Fig. 7) apply to the variations which the average or median dimension may assume without allowing individual oversize or undersize dimensions to be formed.*

warning zones, the machine's production is undoubtedly being contaminated with outsize pieces—or is about to be —and it is time to reset.

If any one or more of the indicator readings disclose measurements beyond either tolerance, the operator of course then knows that out of tolerance work has already arrived.

Where 2 out of 3 measurements fall in the upper or plus **A** zone, Figure 7, the work of course is on its way to oversize. Conversely, 2 out of 3 readings (or all 3) in the minus **A** zone point to undersize work or scrap. The indicator, in other words, readily tells the operator the direction his trouble is coming from.

One more thing: the pair of **A** zones on an indicator can tell whether or not the inherent range of the machine, the natural size variations from it, will cause out of tolerance work despite most normal efforts of the operator to prevent it. For, if in measuring the 3 piece samples, the indicator hand consistently swings into the minus **A** zone, say, for one measurement and as consistently over into the opposite, the plus **A**, zone with another measurement, it is a mighty good indication that the machine or tooling is not intrinsically capable of meeting the prescribed tolerances. All this even though no strictly over tolerance work is immediately noted.

The main resistance to the 2 out of 3 system stems from tradition and habit and also from modern day time and motion tendencies for establishing gag-

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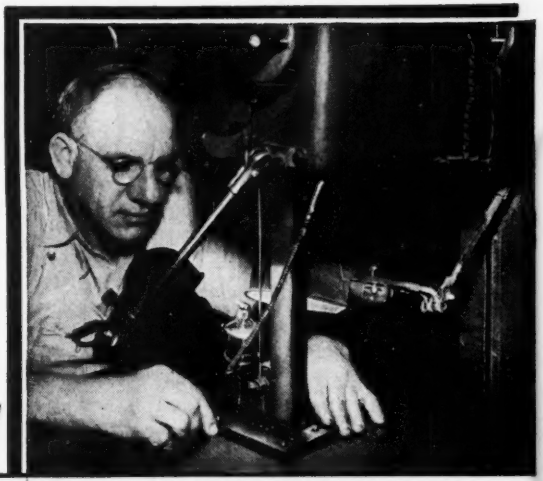

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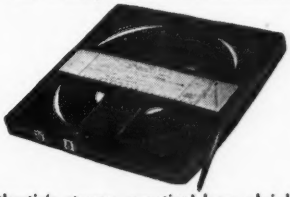

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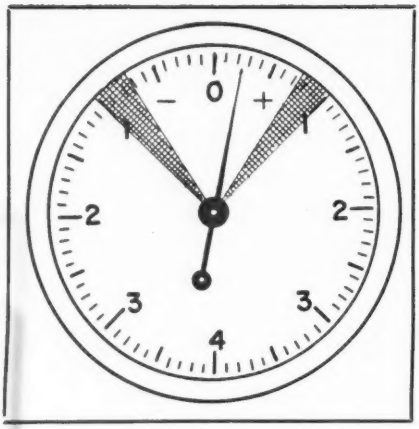


Fig. 7—Illustration showing "banding" method applied to indicator gage.

ing operations based on the examination of a single piece at a time as part of the work cycle. As an example, suppose the stereotyped operating cycle calls for measuring one piece every five minutes. It means that the operator gropes for his mike, snap gage or indicating gage, reaches for a workpiece, measures it, and then disposes of instrument and workpiece. Five minutes later he goes through all the motions again. Contrast this with picking up 3 pieces at once, then the mike or gage, making the measurements, and then putting down the gage and workpieces. This he does once every fifteen minutes. He saves at least two-thirds of the motions, time and energy hunting for his gage, setting it down and getting rid of the workpieces by using them once every fifteen minutes in contrast to once every five minutes.

Most of all, however, by observing his work in groups he knows more about it. The measurement of a single piece tells little or nothing about the

direction the work is taking. It's like viewing the only photograph of one of the plays in a football game. You see the ball in the runner's hands but the lone snapshot does not reveal whether he's going to crash through off tackle, skirt the end, or be thrown for a loss.

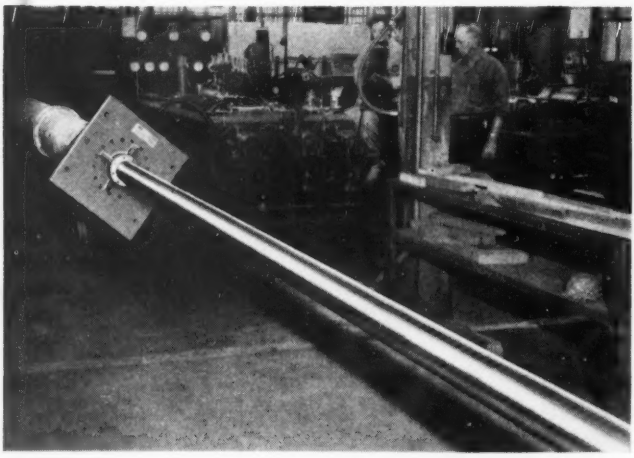
Articles on the subject of quality control for the machine shop appearing in the August 1949 and November 1949 issues of Modern Machine Shop throw other light on the ideas of group measurement and machine capability. Review of them may make the 2 out of 3 techniques more appreciated.

Any shop that will undertake the easy job of comprehending the group system of checking machine work plus the "C" zone or 2 out of 3 concepts just described can cut its scrap and rework bill to the bone. There is a tendency for quality control work to remain entirely in the hands of the inspector or to be carried on by a group or department exclusively delegated the responsibility. Little emphasis need be laid on the idea that the quality of a product rests, in the final analysis, in the hands of the operator, the producer. Whatever will quicken the worker's interest and pride benefits the product. The suggestions made above fit the philosophy of this last statement like a glove.

Automatic Circular Dividing Machine. Bulletin 182-49 published by The Gaertner Scientific Corp., 1291 Wrightwood Ave., Chicago 14, Ill., describes and illustrates a fully automatic machine for the production ruling of precision circular scales according to any standard pattern of lines having industrial or scientific application. The method of operation and construction of the machine are briefly outlined, and detailed specifications are presented. Copy free.

Mammoth Hydraulic Cylinders

THE Logansport Machine Co., Logansport, Ind., manufacturer of air and hydraulic equipment for industrial use, has completed production on two huge hydraulic cylinders of the type illustrated herewith, which are believed to be the largest ever built.



The physical and operating features of these great cylinders are as follows: bore, 14 inches; stroke, 237 inches; 5-inch diameter stainless steel piston rod weighing 1600 lb.; tubing is of centrifugal cast steel; total weight of cylinder and piston, 3½ tons. Overall length of equipment with piston rod extended is approximately 500 inches. The cylinder holds approximately three barrels of oil and imparts 76,000 lb. of impact force when operating at 500 p.s.i.

These cylinders were built for the Reynolds Metals Company with main offices at Listerhill, Ala., and were ordered for use in new casting machines for casting a heavier billet.

Measuring The Mouth Diameters of Tapered Holes

By W. M. Halliday

IN the manufacture of molds, dies, jigs, fixtures, and other similar products, it is often necessary to bore tapered holes to precision accuracy. The machines most commonly used for the boring operations are lathes and jig boring machines. Quite frequently, the machinists have a considerable amount of trouble in boring the tapered holes successfully and accurately due to the fact that it is difficult for them to measure the maximum diameters of the holes. This fact is especially true if the large end of the hole coincides with an end face of the workpiece.

Objections to Customary Gaging Methods

The mouth of a tapered hole is measured to determine either the progress being made in the boring operation or the agreement of the finished bored hole with the dimensions allowed. The difficulties of taking such a measurment are best described by referring to Fig. 1. A tapered hole, **A**, is machined in workpiece **B**; and the large diameter of the hole coincides with the end face, **C**, of the workpiece.

A vernier caliper gage is used to measure the maximum diameter, **D**. The difficulty in measurement lies in locating the contact points of the gage on the extreme edges of the hole. The gage is usually inserted into the hole for a short distance and then withdrawn slightly in order to take a reading; it may be seen, then, that the reliability of the reading will depend, to a large extent, upon the skill and experience of the operator. When using this method of measurement, there is a tendency to bore holes slightly oversize due to the difficulty of locating the contact points of the vernier exactly on the rim of the hole.

One method of overcoming the difficulties of the vernier gage method is to use a master taper plug such as the one shown in Fig. 2. The plug is made to have a short knurled section, a short parallel portion which is turned

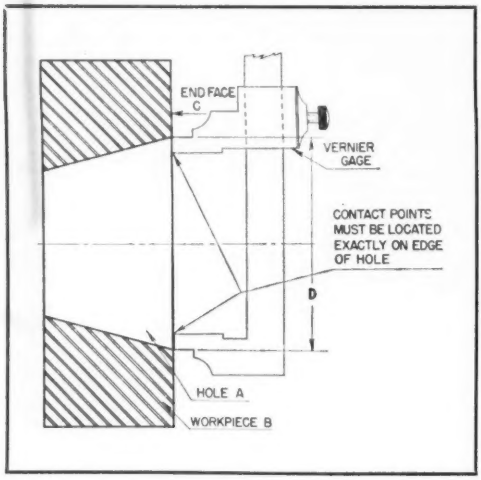


Fig. 1—Drawing of a workpiece having a tapered hole, and method of measuring the mouth diameter by using a vernier gage.

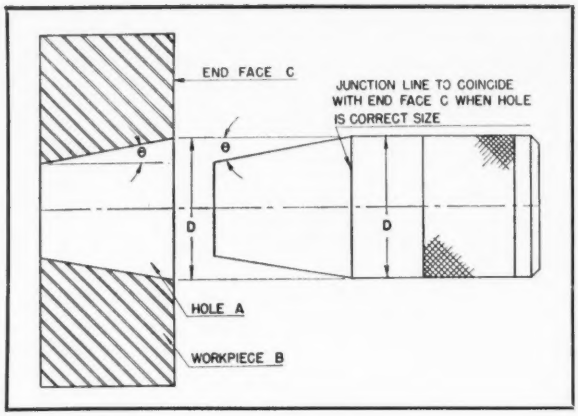


Fig. 2—Sketch showing master taper plug used to check the large diameter of a tapered hole.

or ground to the exact dimension of the large end of the tapered hole in the workpiece, and a tapered end of the exact angle and length as required in the workpiece. The line formed at the junction of the parallel and tapered portions of the plug is used as a setting line in determining the diameter of the bored hole; if the mouth diameter of the hole is correct, the line will coincide with the end face of the workpiece.

Although the plug method gives reliable results on non-precision machine work, it may not always be regarded as completely accurate in cases where close tolerances must be maintained. Also, the method tends to make the job slow and tedious since numerous checks must be taken with

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the plug, particularly during the final stages, in order to determine progress and accuracy.

An adaptation of this method consists of the use of a plug which is machined to a definitely known overall length. The distance, then, which the plug extends out from a hole of correct size will be a fixed amount; and this amount, when added to the width of the workpiece, will give another fixed amount. A depth gage may then be used to check the distance between the end of the plug and the end of the workpiece, and thus check the accuracy of the tapered hole. While this method offers a high degree of precision due to the fact that direct measurements are substituted for visual inspection, the operation is still a lengthy one; and, of course, the master plug may only be applied to one particular size of hole.

An Improved Gage Design

In order to eliminate the disadvantages of the methods which have been mentioned, and to provide an all-purpose measuring instrument which may be used on holes of widely different diameters, an extremely simple and interesting gage has been designed. A drawing of the instrument is shown in Fig. 3, from which it may be observed that the tool consists of three main members.

The body, **E**, is made from a rectangular piece of mild strip steel which is surface ground all over in order to make all sides perfectly flat and opposite sides perfectly parallel. The body is made approximately one inch longer than the diameter of the largest hole which is likely to be measured with the tool. A slot, **F**, is machined as shown in the body; the slot is machined carefully so that its sides will be parallel to the outside edges of the body.

Attached to one end of the body is a rectangular-shaped, mild steel hous-

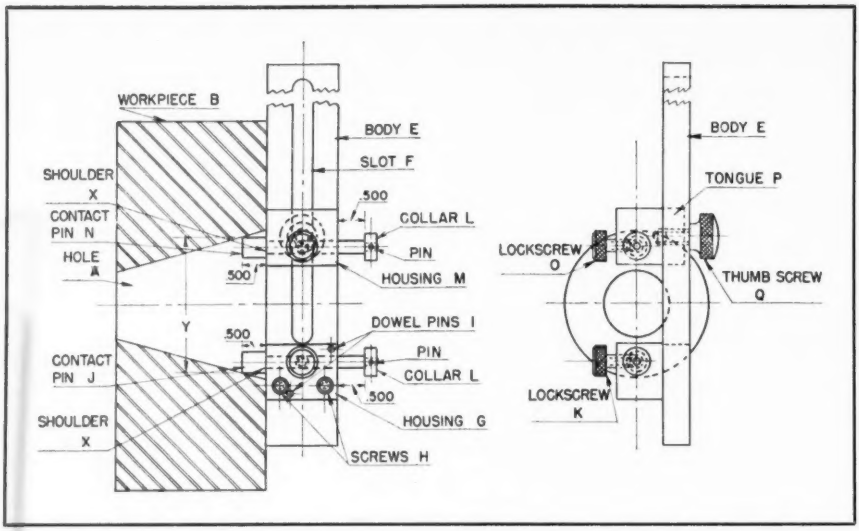

Fig. 3—Drawing of an improved tool for measuring tapered hole diameters.

ing, **G**, of the same width as the body, which is fastened by means of two screws, **H**, and two dowel pins, **I**. A hardened and finely lapped steel contact, or measuring, pin, **J**, is positioned in a carefully bored hole in the housing. The pin is held in place by means of a hard brass, knurled head lock screw, **K**. Pin **J** is machined to three diameters; the middle diameter is approximately ⅛ inch smaller than the largest diameter, and it is machined to provide a close sliding fit within the housing hole. The end opposite the large end is reduced still further to accommodate a check collar, **L**, which is pinned in place. The large end of the pin is finished off perfectly square to have a fine, sharp corner; and this large diameter section is exactly 0.500 inch long. The length of the middle section is exactly equal to the width of the body plus 0.500 inch.

Another housing unit completes the instrument. Housing **M** is similar to housing **G** in that it is used to accommodate a contact pin, **N**, and a lock screw, **O**, which are identical to the

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ones which have been mentioned. However, housing **M** differs from housing **G** in that it is not positioned permanently but is instead provided with a tongue, **P**, which slides on slot **F**. The tongue is tapped to accommodate a knurled head thumbscrew, **Q**; the thumbscrew is used to lock the housing in any desired position along the slot.

Operation of the Gage

The application of this gaging device is extremely simple, rapid, and sure. The first step is to make certain that the shoulders, **X**, of pins **J** and **N** bear up against the side faces of the housings **G** and **M**, and that the lock screws **K** and **O** are tightened down with the pins in this position. Each pin then projects exactly .500 inch beyond the side of body **E**. Thumbscrew **Q** is then unscrewed slightly so that the housing **M** may be moved, and then the tool is located in the hole to be measured in the manner shown in Fig. 3. Pin **J** is positioned originally against one side of the hole, and housing **M** is moved out gradually until pin **N** contacts the side of the hole directly opposite. The housing is locked in this position by means of thumbscrew **Q**, and then the instrument is removed from the hole and the distance across pins, **Y**, is measured with a micrometer.

Lock screws **K** and **O** are now unscrewed, and contact pins **J** and **N** are moved until the under sides of the check collars, **L**, coincide with the sides of the housings, the contact pins now extend out exactly 1.000 inch beyond the side of body **E**. Thumbscrew **Q** is then loosened and a similar procedure is followed in obtaining a reading of the hole diameter at this second station. In order to obtain the diameter at the mouth of the bored hole, the second measured distance is subtracted from the first, and then this

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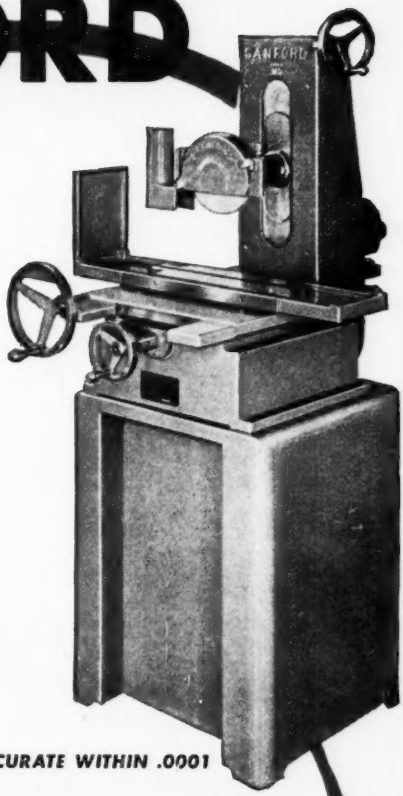

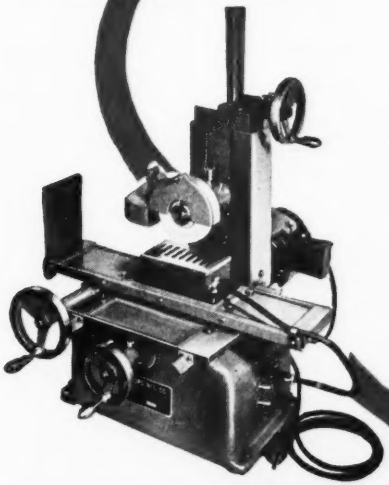

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difference is added to the first reading.

An actual example will perhaps help to demonstrate the simplicity and accuracy of the method. Thus, with the pins set to project out .500 inch from the body, the reading of the distance **Y** across pins is found to be 4.648 inches. With the pins set to project out 1.000 inch, the micrometer reading taken is 3.814 inches. Subtracting the second from the first, a difference of 0.834 inch is obtained. Then, by adding 0.834 inch to 4.648 inches, which was the first reading taken, a mouth diameter measurment may be derived to be 5.482 inches.

Advantages

There are many advantages to a tool of this type, some of which are listed as follows:

(1) A tool of this design gives results to a high degree of accuracy, and the accuracy depends upon actual measurements rather than upon visual inspections.

(2) It is simple to set and also to apply to the workpiece while, at the same time, it involves a minimum amount of arithmetical calculations. The calculations are of a straightforward nature which may be easily comprehended by the machine operators.

(3) The tool is quite inexpensive to make.

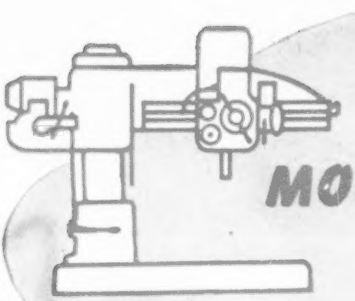
(4) The tool may be applied to holes of widely different diameters due to the adjustment provided by the movable housing.

(5) By reducing the diameters of the contact pins considerably, holes of very small diameters may be checked with equal facility.

(6) Holes may be checked quickly and accurately during the progress of the boring operation; and, at each check, the exact amount of metal to be removed to bring the hole to proper size may be determined. Such a check is an invaluable aid to the machinist.

"Taps Last Longer" is the title of a helpful brochure announced by the Procunier Safety Chuck Co., Dept. 15, 12 S. Clinton St., Chicago 6, Ill., which is printed in color and features a complete line of new cover clamping tapping heads. In addition, the brochure illustrates a group of economical accessories and adapters for increasing the utility for Procunier tapping heads. Copy free on request.

Precision Box Fingers. The O'Neil Irwin Mfg. Co., 306 Eighth Ave., Lake City, Minn., now has available a four-page two-color brochure illustrating and describing precision box fingers which are said to quickly convert any "Di-Acro" brake into a precision box and pan brake. Other products of the company, including brakes, punches, notchers, and shears, are also shown and described. Copy free.



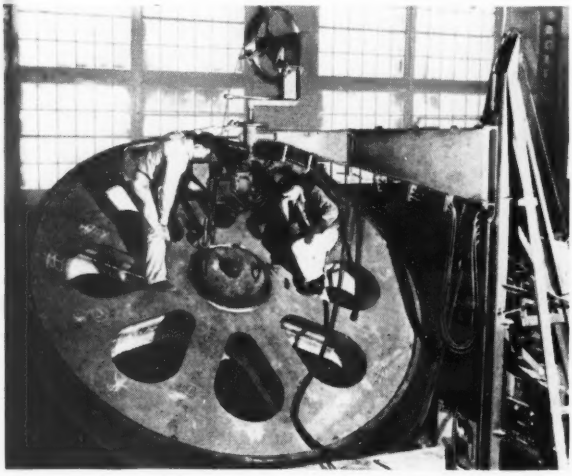
MODERN EQUIPMENT AT WORK

7½ Ton Marine Bull Gear Welded at Westinghouse Plant

THE accompanying illustration shows a seven and one-half ton bull gear being fabricated at the Sunnyvale, California, Works of Westinghouse Electric Corp. The hub is being welded to a centerplate as flux is fed automatically and the wheel is turned slowly under the Unionmelt welding machine. The gear shown is one of two similar gears used to drive a large, marine ore carrier. The two gears are used in the final stages of a gear train to reduce the speed to the propeller shaft from 6000 rpm to 100 rpm; they take the full load of a 7000 h.p. marine turbine propulsion unit.

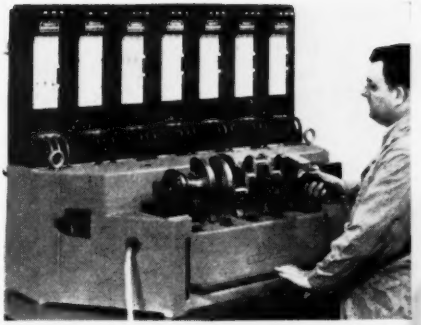
The gears are made from two kinds of steel; the rims, which are hobbed later with 693 helical teeth, are of high-carbon steel to withstand great pressures under continuous operation; and the other parts—the hubs, the centerplates, and the ribs—are of mild or medium carbon steel.

Despite the size of the gears, they are held to close tolerances so that, when they are completed and installed in a ship, they will give trouble-free operation. Since the slightest inaccuracy in the gear teeth will cause excessive vibration and noise, inspection is rigid; and even a small imperfection will cause rejection. Tolerances for the teeth may be as close as one ten-thousandth of an inch.



The hub of 7½ ton bull gear is shown being welded to a centerplate.

(Right) Sheffield gaging unit which uses 20 Precisionaire tubes for checking dimensions of automobile crankshafts.



Sheffield Unit for Checking Automobile Crankshafts

A GAGING machine which uses 20 Precisionaire tubes has been developed by The Sheffield Corp., Dayton 1, Ohio for checking various dimensions of an automobile crankshaft. The accompanying illustration shows a crankshaft in gaging position in the unit.

The five main bearings are checked simultaneously by means of five U-shaped Airsnaps. Each of these Airsnaps is provided with three pairs of jets so that the bearing surfaces may be checked at three places, and the Airsnaps are floated so that they may move forward and backward to allow for misalignment due to possible warpage in the crankshaft. Two other Precisionaire jets check a seal diameter and the width of the rear main bearing. The diameter at each end of the pin bearing and the breakdown of the radius at the cheeks are checked manually by means of a portable Airsnap having three sets of jets.

Fig. 1—Shown here are three H-P-M hydraulic presses used for drawing aluminum cooker shells. Two special conveyor racks may be seen between the presses.

Drawing and Bulging of Aluminum Cooker Shells

ONE of the unique features of a new Hotpoint electric range is that the heating element at the bottom of the deep well cooker may be raised to provide an additional surface burner when the deep well cooker is not in use. In order to provide this feature, Hotpoint engineers developed an aluminum cooker shell having a bulged side section to accommodate the sliding electrical connections for the heating element.

The problem of producing these irregularly shaped cooker shells on a mass production basis was solved by Hotpoint engineers in cooperation with engineers of The Hydraulic Press Mfg. Co. of Mt. Gilead, Ohio. In addition to standard deep drawing operations for the cooker shells, an unusual bulging method involving the use of high-pressure hydraulic fluid was developed.

Due to the depth of the cooker shells, three drawing operations are required for each part prior to the bulging operation. The drawing operations are performed in three H-P-M double-action hydraulic presses which draw a 21 inch diameter blank, 0.040 inch thick, to a depth of 9¼ inches. Annealing between draws is not required. The time required for each

Fig. 2—Close-up view showing hydraulic bulging die.

drawing operation is approximately ten seconds. Specially designed conveyor racks have been designed which permit the drawn shells to be rolled between presses, thus eliminating unnecessary handling. The relative positions of the racks between the presses may be seen in Fig. 1.

After the third drawing operation, the cooker shells are washed and annealed; and then the drawn shells are delivered to the fourth H-P-M hydraulic press which is equipped with an hydro-bulging die. A drawn shell is sealed in the die by the press; and hydraulic fluid, under pressure of 2000 p.s.i., is forced into the drawn shell to bulge it to the desired shape. The

fluid is then decompressed, the die is opened, and the bulged shell is released. An average of 165 shells per hour may be bulged in this press. A close-up view of the bulging die is shown in Fig. 2; a drawn shell prior to bulging may be seen at the lower right, and a bulged shell may be seen in the operator's hands.

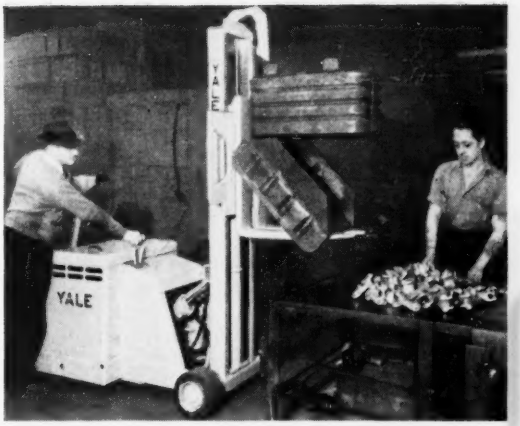
The new H-P-M hydro-bulging process offers a practical solution to the problem of producing irregular shapes. Close tolerances may be maintained; and, according to the manufacturer, scrap losses may be kept to an absolute minimum. The process is also being used successfully in the production of milker pails, cream separator supply cans, cooking utensils, silver plated ware, and similar products.

Batch Discharge Replaces Method of Hand Unloading

ONE ingenious method of unloading small castings and machined parts is shown in the accompanying illustration. The parts are carried in a special hinged drop-bottom bin on a Worksaver-type Yale fork truck; and when the proper work station is reached, the main section of the bin is raised, the bottom section of the bin is lowered, and the parts are discharged in the chute formed, as shown. The two obvious advantages of this method over the method of hand unloading are (1) a definite decrease in unloading time, and (2) the fact that employees are saved from possible cuts and pinched fingers due to sharp edges or the shifting of parts in the bin.

A large eye is welded to one end of the main section of the bin, and the bottom section of the bin is hinged to this eye. A chain-operated hook is provided at the top of the truck mast to engage the eye in order to hold the main bin section in a raised position.

Drop-bottom bin being used for discharging small parts.



In operation, a loaded bin which has been carried to the proper work station is raised, by means of the truck forks, until the height is sufficient for the chain-operated hook to be engaged in the bin-eye and thus hold the main section in an elevated position. The forks of the truck are then lowered; and, simultaneously, the bottom section of the bin is rotated on its hinge and the parts are discharged. By regulating the angle through which the bottom section is rotated, the rate of discharge may be controlled.

After the bin has been emptied, the truck forks are raised to bring the bottom bin section to its normal position, the truck hook is disengaged from the bin-eye by the operator, and the forks are lowered to bring the bin to its original position. The empty bin may then be transported for reloading, or it may be stored; as may be

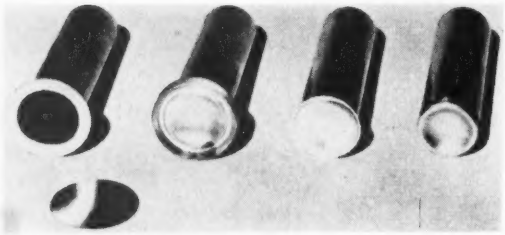


Fig. 1—Typical application of ring weld technique of cold pressure welding may be seen in hermetically sealed containers. Steps shown (left to right) are flanged tube before welding, tube after welding, tube after excess metal has been trimmed off, and tube after weld has been dressed over.

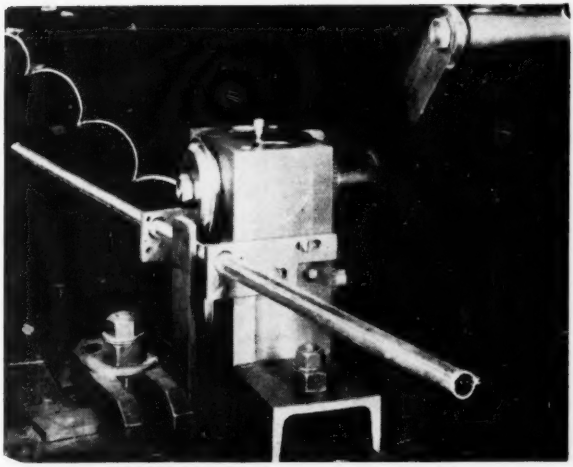
seen, lugs are welded to the top of the bin to facilitate the stacking of similar bins.

The equipment used is manufactured by the Philadelphia Division of The Yale & Towne Mfg. Company.

Cold Pressure Welding

THE method of welding by means of pressure at room temperatures, or cold pressure welding, has been developed by the General Electric Company, Ltd., of England; and it is controlled in the United States by the Koldweld Corporation of New York City. The process may be applied successfully to several of the non-ferrous metals—aluminum, duralumin, cadmium, lead, copper, nickel, zinc, and silver; however, for the present, its most important application is for the cold welding of aluminum. Experimental work on cold pressure welding of ferrous metals is currently being conducted, but research is not complete as yet.

Fig. 2 — Machine used for making seam welds. Trimmed metal may be seen curling away.



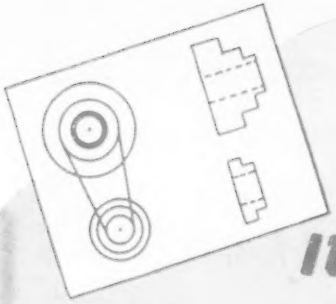
Aluminum surfaces which are to be welded must be entirely free from oxide films which begin to form on the exteriors immediately after the surfaces are exposed to the atmosphere. Although the films are thin by ordinary standards, they are thick enough to prevent good welds from being obtained. These oxides may be removed by standard methods; and once they are removed, the re-formation of oxide films progresses rather slowly. Therefore, satisfactory welds may be made several hours after the film removal operation if the cleaned surfaces have not meanwhile become contaminated by moisture or grease. Even contam-

ination such as that caused by handling of the material will invariably prevent formation of satisfactory welds.

In the cold pressure process of welding the metal is made to flow away from the welding point as the tools are brought together. It is perhaps surprising that the rate of application of the pressure does not appear to affect the strength of the weld, and that good welds may be made with tools giving either a slow squeeze or an impact. However, the shape of the tool used is an important consideration.

During the runs which have been carried out so far with suitable die materials, there has been very little evidence of die wear. In many applications, however, it will be possible to counteract the effects of such wear by occasionally resetting the die closure.

Three somewhat different techniques have been developed for the cold pressure welding process—the straight weld, the ring weld, and the continuous seam weld. The straight weld technique may be used for box seams, for sealing tube ends, and for other similar forms of lapped joints which are almost equivalent to butt welds. The ring weld technique may be used for sealing the end of a flanged tube, as illustrated in Fig. 1; for joining a flanged tube to a plate for making hose connections, and for joining two discs together to form an air pressure cell. Wheels also may be constructed, using this technique, by taking advantage of the natural flow of the material in order to form the desired shape. Among the important applications of the seam weld technique are included tube-making and sheathed cables. A typical continuous seam weld application is illustrated in Fig. 2.



IDEAS FROM READERS

Assembly Spot Welding Technique for Aircraft Parts

By GILBERT C. CLOSE

SPOT welding production has been stepped up at the Northrop Aircraft, Inc., plant by the use of a technique which the engineers call "assembly spot welding". By using this technique, several pre-welding steps, which were formerly considered necessary, are eliminated.

In a conventional spot welding operation, the components of a given unit are first jig-assembled; and then they are trimmed, fitted, and removed from the jig for cleaning and etching. The components must then be rejigged prior to spot welding; and some components, especially those of sheet metal in which spring-back tendencies are inherent, are difficult to re-jig to an exact fit.

With the new procedure at Northrop, the unit components are now jigged, trimmed, and fitted and then held in correct position by means of a few rivets and Cleco clamps. The partially assembled unit is then removed from the jig, cleaned and etched, and finish-welded without rejigging. Fig. 1 shows aircraft engine cowl segments in assembly jigs; a "tacked" cowl section

Fig. 1—Aircraft engine cowl segments in assembly jigs prior to spot welding.

Fig. 2 — A "tacked" cowl section, held together by means of a few rivets and Cleco clamps, is shown being etched and cleaned.

is shown being cleaned and etched in Fig. 2; and in Fig. 3 is shown a final spot welding operation.

The assembly of the components is loose enough to permit etching solution to enter lap joints, and yet it is strong enough to keep the relative positions of the components unaltered. A K1-B etching solution furnished by Kelite is used. The solution is sufficiently inhibited to prevent chemical attack and deterioration of the removable and re-usable Cleco clamps.

Elimination of the rejigging operation through the application of the "assembly spot welding" technique has resulted in the saving of a considerable amount of time without a reduction in the quality of the finished product.

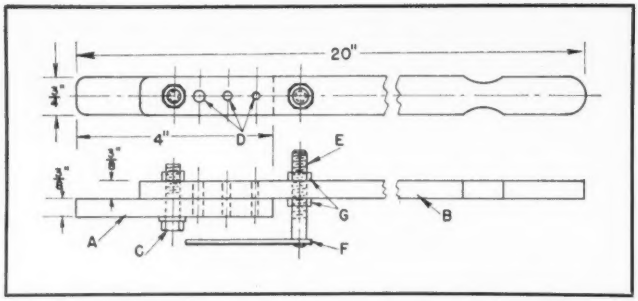
Fig. 3—Illustration shows final spot welding operation.

Handy Small Pin Cutter

By Rudolph G. Kopp

OCCASIONALLY the writer has found it necessary to cut a few hundred small pins at a time, and so a handy cutting device was made to be used for the jobs. It was found that, with the device, satisfactory pins could be obtained from drill rod, cold rolled steel, and brass.

A sketch of the device is shown herewith. As may be seen, the device consists primarily of two plates, **A** and **B**, which are fastened together by bolt **C**. Some clearance is allowed so that bolt **C** may serve as a pivot. Holes of



Sketch of handy cutting device for small pins.

different diameters, **D**, are drilled in line through both plates to accommodate different diameters of work. A screw of suitable length, **E**, is threaded through the top plate, **B**; and a thin positioning plate, **F**, is riveted onto the end of the screw. Two nuts, **G**, are used to hold the screw in place.

To use the cutting device, plate **A** is first clamped in a vise, and then nuts **G** are unscrewed and screw **E** is adjusted until the distance between the bottom of plate **B** and the top of positioning plate **F** is equal to the required height of the pins being cut. The round stock is next inserted into the appropriate hole until it rests on plate **F**; and then plate **B** is rotated, this rotation providing for the desired cutting action. Despite the fact that plates **A** and **B** are only cold rolled steel, case hardened at their cutting ends, this cutting device has given satisfactory service for more than ten years and it is still going strong.

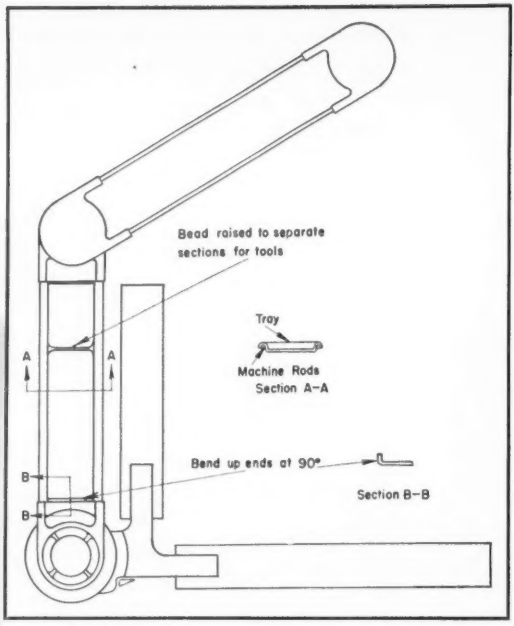
Special "Half-Hole" Drill Jig

By Lee Roy Perdue

"HALF-HOLES", which were formerly rasped out with a file, are now being drilled with an electric drill at the Texas Engineering and Manufacturing Co., Inc., in Dallas, Texas. As a result, not only has the amount of time required for the operation been reduced 50 per cent; but also, the holes themselves are cleaner and more uniform. The change in production was made possible by the use of a special "half-hole" drill jig which was developed in the machine shop at the plant. The accompanying illustration shows the special jig in use.

Workman shown using special jig to drill "half-hole" in steering collar. A completed "half-hole" may be seen at the lower left.

The "half-holes", which are cut in C-54 nose-gear steering collars, are provided in order to make room for tension bolts. The special jig devised



Sketch showing a handy tray which is fitted onto the lower arm of a drafting machine.

Handy Drafting Machine Tray

By STANLEY R. WELLING

A HANDY addition to a drafting machine has been made by the author, and this addition has proved to be extremely practical. As may be seen in the accompanying sketch, the addition is simply a metal tray for pencils and instruments which is fitted across the two cylindrical tubes of the lower arm of the drafting machine and which extends the entire distance between the pivot braces. The tray is formed from a piece of light gage sheet to conform to the shape of a shallow box; the side edges are rolled so that they may be fitted over the tubes, and the extreme ends are bent up at right angles. Fasteners are unnecessary since the tray extends over the full open length of the lower arm.

One bead is provided between the sides of the tray not only to strengthen the tray, but also to make two tray sections for segregation of tools. The

for drilling these "half-holes" consists essentially of a steel plate and a block which may be attached quickly by means of locating pins in order to provide a two-point guide for the drill. According to machinists at the plant, the "half-hole" drill jig eliminates hand work; and yet excessive set-up time, which would be required to perform the operation in a milling machine, is not needed.

tray has been a particularly worthwhile addition since the tools are always handy, since the possibility of tools being pushed on the floor and broken has been reduced, and since the drawings may be kept neater and cleaner when there are no tools scattered over them.

A Positive Safety Device

By Robert Mawson

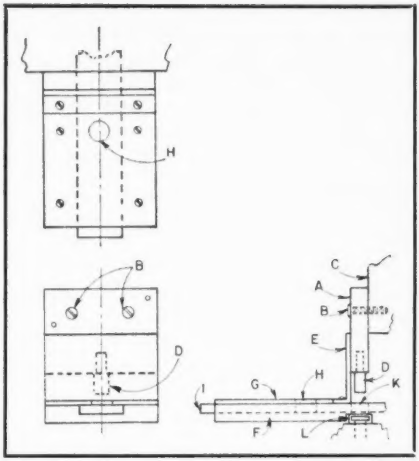
THE attachment of a positive safety device on a foot operated press is a necessity which should not be overlooked. In plants which do not have these devices the accident rate is high; and the loss of a finger or of a part of a finger is not an uncommon occurrence. In some plants in which safety devices are installed, the devices are adequate, but their design is such that the rate of production is reduced considerably. Described herewith, and shown in the accompanying illustration, is a positive safety device which does not reduce the rate of production.

A machine steel member, **A**, is fastened by means of screws, **B**, to the ram, **C**, of the foot operated press. A punch, **D**, suitable for the particular job, is held securely to the bottom of member **A**. A sheet steel guard, **E**, is positioned in front of member **A**, and the guard is fastened to the press table, **F**, by means of screws. A suitable guide plate, **G**, is also fastened to the

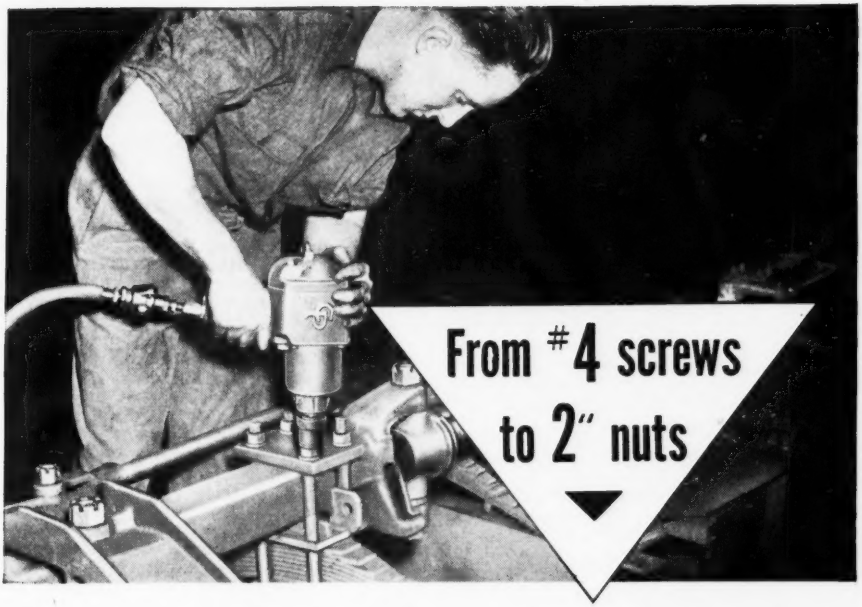
table by means of screws; and a hole, **H**, is drilled in this guide plate to accommodate the blank being formed. A sliding ram, **I**, thicker than the blank being formed, is located under the guide plate and in a recess in the table; and a hole, similar to the hole in the guide plate and located initially directly beneath it, is machined in the sliding bar. The rear end of **I** is attached, by means of an adjustable link mechanism, to the foot operated lever of the press thereby controlling the movement of the sliding ram; and this mechanism permits the hole in **I** to be brought directly under the punch as the sliding ram is moved to the rear of the device. The sliding ram moves horizontally as the press ram moves vertically.

The following is the procedure followed when a piece is formed in the press: A blank is placed through the hole **H** and into the hole in the sliding ram. The foot pedal is then pushed down—the sliding ram, in which the blank is held, is pulled to the rear by the adjustable link mechanism; and, at the same time, the ram and the punch are moved downward. The movements of the sliding ram and the press ram are calculated and set so that the blank will be directly under the punch for the forming operation. The downward movement of the punch is continued, and the force of the punch pushes the formed workpiece through hole **K** in the press table and into the die, **L**. Various operations may be performed on the piece in the die, and the finished piece is then dropped through a hole in the die into a container. The foot pedal is then released—the motion of the mechanism is reversed, and the press is made ready to receive another piece.

It may be seen that, with this device, it is impossible for an operator to get his finger under a punch. In addition, this device does not retard production.



Sketch of a positive safety device which does not reduce the rate of production.



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News of the Industry

N. T. D. M. A. Holds Annual Convention

The New York Statler Hotel was the meeting place for the recent annual convention of the National Tool and Die Manufacturers Association, which is composed of over 500 contract manufacturers of special tools, dies, fixtures, molds, gages, jigs, and special machinery used in industrial mass production.

Panel discussions were held at both general sessions of the convention. At the first, "Business Problems of Tool & Die Manufacturers," Alexander W. Luce, head of the mechanical engineering department of Pratt Institute, Brooklyn, N. Y., served as moderator. Moderator at the panel on "Employer-Employee Relations" was John S. Higgins, president and general manager of Whittet-Higgins Co., Providence, R. I. Another highlight of the convention was the impressions of E. Slater of Slater & Crabtree, Ltd., Wakefield, England, a member of the British Tool & Gagemakers Association, who compared the tool and die industries in the United States and in England.

Officers for the coming year were elected at the convention. They are: president—Centre W. Holmberg, president of Aug. W. Holmberg Co., Inc., N.Y.C.; 1st vice president—Herbert F. Jahn, president of B. Jahn Mfg. Co., New Britain, Conn.; 2nd vice president—R. H. Cope, manager of Bunell Machine & Tool Co., Cleveland, Ohio; secretary—Alfred Reinke, president of Gus Reinke Machinery & Tool Co., Hillside, N. J.; treasurer—Herbert Harig, vice president and treasurer of Harig Mfg. Corp., Chicago, Ill. George S. Eaton will continue as executive secretary. The headquarters of the association are in the Union Commerce Building, Cleveland.

Awards of merit were presented to J. J. Kohl, president of the International Tool Co., Dayton, Ohio, retiring president of the association; Jerome H. Stanek, vice president of Stanek Tool & Mfg. Co., Milwaukee, Wis., retiring secretary of N. T. D. M. A.; and Jack Kleinoder, secretary-treasurer of John Volkert Metal Stampings, Inc., N. Y. president of the N. Y. Tool & Die Institute, which was host to the convention. The convention ended with a dinner dance sponsored by the N. Y. Tool & Die Institute in the Grand Ballroom of the Statler Hotel.

Machine Tool Familiarization Training Programs

Sales engineers from metal and petroleum firms all over the nation will gather in Rochester, N. Y., for the fifth in a series of intensive nine-day Machine Tool Familiarization training programs to be held January 18-27 at the Rochester Institute of Technology. Designed to acquaint the sales or service engineer, manufacturer's agent, tool or accessory salesman with the equipment used by the

New Officers of National Tool & Die Manufacturers Association: (Left to Right, Seated) 1st Vice President, Herbert F. Jahn; President, Centre W. Holmberg; 2nd Vice President, R. H. Cope; (Standing) Secretary, Alfred Reinke; Treasurer, Herbert Harig.

manufacturer buying his products, the "shop clothes" clinic will enable the student to acquire shop knowledge necessary in promoting good customer relationships.

The staff will be composed of representatives of the machine tool builders and equipment manufacturers, augmented by members of the institute faculty. Six unusual laboratories will be utilized for the clinic. The program will consist of a series of demonstrations and on-the-spot discussions and laboratory periods scheduled from 8:30 a.m. to 5 p.m. each day of the clinic except Sunday.

Tuition for the course is $100, which includes all course materials and a special dinner meeting for participants to be held Thursday evening at the Hotel Rochester. Inquiries concerning the course should be addressed to the course coordinator: Alfred L. Davis, Associate Director, Evening and Extension Division, Rochester Institute of Technology, Rochester 8, New York.

New Whitney Chain Office and Warehouse

Whitney Chain & Manufacturing Co., Division of Whitney-Hanson Industries, Inc., has recently moved to new and larger headquarters at 3317-25 W. Newport Ave., Chicago 18, Ill. The recently completed one-story building is completely modern and includes 15,000 square feet of floor space.

The new location offers up-to-date facilities with which to quickly meet customer requirements. A complete line of American Standard roller chains, silent chains, conveyor chains, couplings, and sprockets will be available from stock at all times.

Offers Representation in India, Pakistan and Ceylon

Bakhshi Ram & Co., G.P.O. Box No. 701, Bombay 1, India, is offering exclusive representation in India, Pakistan, and Ceylon to American firms manufacturing the following products: steel files, taps, dies, belt lacings, water pipe, rainwater pipes, bolts and nuts, wood screws, hack saw blades, pipe wrenches, screw drivers, pliers, steel tapes, leather case tapes, drill chucks, lathe chucks, ball bearings, pillow bearings and blocks, small hand tools, and small electric tools for workshops.

1950 Metal Powder Show

The Metal Powder Association, 420 Lexington Ave., New York 17, N. Y., has announced that the 1950 Metal Powder Show will be held in Detroit on April 25-26 at the Book-Cadillac Hotel. The sixth consecutive meeting and exhibit devoted exclusively to the metal powder industry, this show will provide a display of the latest products and developments of producers of metal powders, fabricators of parts made from metal powder, and manufacturers of equipment used in powder metallurgy.

Cam Design and Tool Selection Clinic

Process and tool engineers, estimators, cam and layout designers, plant and department supervisors in screw machine companies from the nation's industrial centers will meet at Rochester, N. Y., to attend an intensive Cam Design and Tool Selection Clinic to be held at the Rochester Institute of Technology. The five-day course will open February 20 and will be under the direction of Edward W. Goebel, head of the R. I. T. Screw Machine Laboratory.

Designed primarily for experienced screw machine personnel, the course will emphasize advanced technology utilized to obtain increased efficiency and lower costs. The program will be conducted on the basis of two two-and-a-half day conferences. The first session, from February 20 to 22, will be devoted to a series of job problems related to Brown & Sharpe cam and tooling. The second, from February 22 to 24, will be comprised of typical jobs on tooling multiple spindle. Applicants may register for either the first or second sessions, or, if desired, for the complete five-day conference, depending on plant equipment or personal interests.

The fee for attending the course is $30 for each two-a-half day session or $50 for the combined five-day course. Application for registration should be made direct to the Rochester Institute of Technology, Rochester, N. Y., to the attention of Alfred L. Davis.

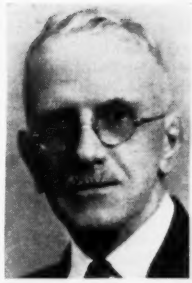
Corporation Formed to Market Absorbents

Speedi-Dri Corporation has been formed to market the oil and grease absorbents known as "Speedi-Dri" and "Sol-Speedi-Dri" in the New England states, New York, eastern Pennsylvania, and part of New Jersey. R. H. Hubbell, Jr. is president of the new firm. Other officers include Warren E. Sawyer, Jr., vice president, secretary and treasurer, and R. A. Hogan, sales manager.

The firm has established its main headquarters at 210 W. Washington Square, Philadelphia. All sales will be handled by the New York City office at No. 1 Wall Street. Waverly Petroleum Products Co., Philadelphia, will continue as distributor for both Speedi-Dri and Sol Speedi-Dri in western Pennsylvania, the South, the Middle West, West, and Southwest.

William E. O'Connor

William E. O'Connor of Philadelphia, Pa., for 42 years associated with The Cleveland Automatic Machine Co., Cincinnati, Ohio, died recently following a heart attack at the age of 75 years. Mr. O'Connor was born in Manchester, England and came to Chesterville, Ontario, Canada as a boy. After completing schooling at Chesterville, he came to the United States in 1895.



William E. O'Connor

In 1906 Mr. O'Connor became associated with The Cleveland Automatic Machine Company, which at that time was located in Cleveland, Ohio, after working several years in Chicago, Illinois, for a manufacturer of bicycles. His first assignment with Cleveland Automatic was in the testing department where he had such unusual ability as a mechanic and tester that he was soon promoted to the position of service engineer for Cleveland Automatic's New York territory, a position which he held until the time of his retirement in October 1947.

Did You Know?---

Alexander Nimick, Sr., works manager of the Colonial Steel Division of Vanadium-Alloys Steel Co., Latrobe, Pa., died recently after an association of 35 years with Colonial Steel.

— o —

Bernard Lester, long active in the Machine Tool Refresher Course and originator of the Westinghouse Machine Tool Forum, **John A. Silver** and **Frank W. Hankins** have announced the formation of the management engineering firm of Lester, Hankins and Silver. Specializing in the management, distribution and sales problems of manufacturers and distributors of machinery, equipment and technical products, the company has offices at 1605 Race Street, Philadelphia and 140 Cedar Street, New York.

— o —

Hauser Machine Tool Corp., 30 Park Ave., Manhasset, L. I., N. Y., has been appointed exclusive United States factory representative for S. Lambert, S. A., Solothurn (Soleure), Switzerland, manufacturer of gear generating and hobbing machines, wheel cutting machines, and plate facing and recessing machines.

J. C. Stites has been appointed assistant manager of sales and export sales manager of The Cleveland Twist Drill Co., Cleveland 14, Ohio. Formerly with the company's field sales division, Mr. Stites is taking over the position formerly held by **H. P. Jenson,** who died recently. **R. O. Artner,** formerly manager of the company's Detroit stockroom, has been promoted to the field sales division.

— o —

John W. Jessen, 417 East "C" St., Iron Mountain, Mich., has been appointed representative in the Upper Peninsula to handle drill jig bushings, steel stamps, and marking devices as produced by Colonial Bushings, Inc., Box 37, Harper Station, Detroit 13, and New Method Steel Stamps, Inc., 149 Jos. Campau, Detroit 7, Michigan.

— o —

Ben Sloan, Newark, New Jersey representative of Pratt & Whitney for 30 years, died recently after establishing a record of over 42 years of continuous service with the organization.

— o —

Union Twist Drill Co., Athol, Mass., manufacturer of carbide, carbon and high speed steel cutting tools, has announced the appointment of **Machinists Tools Inc.,** 854 Main St., Buffalo, N. Y., as its distributor in Buffalo and surrounding territory.

— o —

Edward H. Roos, with 25 years of experience in production and factory management in the East, has been appointed factory manager of the C. A. Norgren Co., Denver, Colorado.

— o —

Pope Machinery Corp., 261 River St., Haverhill, Mass., has named **Arthur J. Renz** as field engineer on precision spindle applications.

— o —

Frank D. Mumford has been appointed parts sales manager of the E. W. Bliss Company, manufacturer of stamping presses, rolling mills, and container machinery.

— o —

Mathews Dick, Jr., formerly with the International Harvester Company, has been appointed sales engineer in the Chicago area by the Butterfield Division of Union Twist Drill Co., Derby Line, Vt., manufacturer of taps, dies, reamers, and special metal cutting tools.

Did You Know?---

Spencer R. Griffiths, formerly associated with Joseph T. Ryerson & Son, Inc., in charge of stainless steel sales in the midwest district, has been appointed assistant sales manager of Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7, Illinois.

— o —

The **F. H. Harris Co.,** 340 Main St., Worcester 8, Mass., has been appointed service and sales representative on gear cutting and finishing machines, gear cutting tools, and gear checking equipment made by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Michigan.

— o —

The automatic air-hydraulic drill head formerly manufactured by the **Cleveland Republic Tool Corp.,** Cleveland, Ohio, has been acquired by the **Rockwell Mfg. Co., Delta Mfg. Div.,** Milwaukee 1, Wis., as an addition to its line of Delta-Milwaukee power tools.

— o —

The Elastic Stop Nut Corporation of America, Union, N. J., has appointed **Donald B. Sorenson** as sales engineer in charge of the Wisconsin and Minnesota area.

The **Ready Tool Co.,** Bridgeport, Conn., has recently acquired all the patent, manufacturing, and sales rights of the Barter-Ritco reversible grinder dog formerly manufactured by the **Rhode Island Tool Co.,** Providence, R. I. Machinery and equipment for the manufacture of this dog will be transferred to the Ready plant in Bridgeport.

— o —

Announcement has been made of the acquisition of the controlling interest of the 82-year old Ottumwa Iron Works, Ottumwa, Iowa, by **Lou Mervis,** industrialist and present head of the Pittsburgh Gear Co., Pittsburgh, Pennsylvania.

— o —

F. H. Harris Co., 340 Main St., Worcester 8, Mass., has been appointed New England service and sales representative for the broaches, broaching machines, hydraulic presses, and other equipment produced by the Colonial Broach Co., Detroit 13, Mich. Harris will also handle drill jig bushings, steel stamps, and marking devices produced respectively by Colonial Bushings, Inc., Detroit 13, and New Method Steel Stamps, Inc., Detroit 7, in the territory including Vermont, New Hampshire, Maine, Massachusetts, and Rhode Island.

David Ayr

Richard E. LeBlond

Fred'k S. Blackall, Jr.

Jerome A. Raterman

R. W. Glasner

National Machine Tool Builders Elect New Officers At Annual Meeting

DAVID AYR, president and general manager of the Hendey Machine Company, Torrington, Conn., is the new president of The National Machine Tool Builders' Association, following his election at its 48th Annual Meeting at Hotel Greenbrier.

Richard E. LeBlond, president of The R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, and Frederick S. Blackall, Jr., president of The Taft-Peirce Manufacturing Company, Woonsocket, R. I., were elected first and second vice presidents, respectively.

Jerome A. Raterman, president of The Monarch Machine Tool Company, Sidney, Ohio, was elected treasurer. Tell Berna continues as general manager and Mrs. Frida F. Selbert was again named secretary.

Three new directors were also elected. They are Mr. Blackall, Mr. Raterman and R. W. Glasner, president of the Clearing Machine Corporation, Chicago, Ill. They will serve three year terms.

Mr. Ayr received his early training at Brown & Sharpe Manufacturing Company, Providence, R. I. Later he was associated with the Pierce-Arrow Motor Car Company at Buffalo, and in 1924, with the Pratt and Whitney Division of Niles-Bement-Pond Company as works manager. He was elected president and general manager of The Hendey Machine Company in 1932, which position he now holds.

A new formula for weeding out obsolete machine tools in metal-working plants throughout the country was presented at the meeting by L. W. Scott Alter, president of The American Tool Works Company. Urging a virtual national roundup of obsolete equipment, for replacement with new machines according to rules which make "financial sense", Mr. Alter emphasized that " it is in the interest of everybody" that withdrawal of such equipment be encouraged. He stressed that outmoded ideas of "horse trading" equipment policies, based on replacement of "machine by machine" were the "least desirable" ways

to encourage modernization of factories. Instead, "a far better approach is on an over-all basis." Mr. Alter's plan calls for a "plant equipment ledger" with a standing in financial accounting equal to any company's "portfolio of securities."

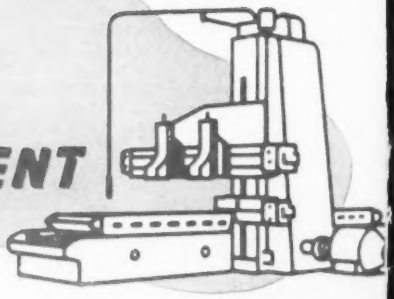
A. G. Bryant, chairman of the Government Relations Committee of the NMTBA charged that American industry is not as strong relatively as it was before the war and recommended an American Recovery Program. Mr. Bryant, who is vice president of the Cleereman Machine Tool Company and president of The Bryant Machinery and Engineering Company, asserted that our industrial plant has stagnated since the end of the war and that the "creeping paralysis of inefficiency eventually will lead to the undermining of our standard of living." He proposed an American Recovery Program based upon the following three points.

1. Guide every step of our foreign policy along roads that will require our aid to be used in the establishment abroad only of those industries that will utilize available local resources to best advantage and will not merely duplicate facilities that already exist in this country and are ample to supply world requirements.
2. Stimulate the rehabilitation of the American industrial plant, which, although the best in the world, has been allowed to deteriorate by failing to replace its outmoded prewar machinery with postwar designs.
3. Substitute in Government a constructive attitude of reassurance to industry that efficiency and well-earned profits are to be encouraged, in place of current policies which penalize progressive management and cast uncertainties in the path of venture capital.

Name Plate Stamping Service

Facilities for the production of die stamped name plates for product identification, company trade marks, brand names, slogans, and so on, have been announced by the Federal Tool & Mfg. Co., 3620 Alabama Ave., Minneapolis 16, Minn. Name plates can be made to customer specifications in sizes up to 9 x 12 inches and of any metal up to 3/32 inch thick, providing it can be stamped.

NEW SHOP EQUIPMENT

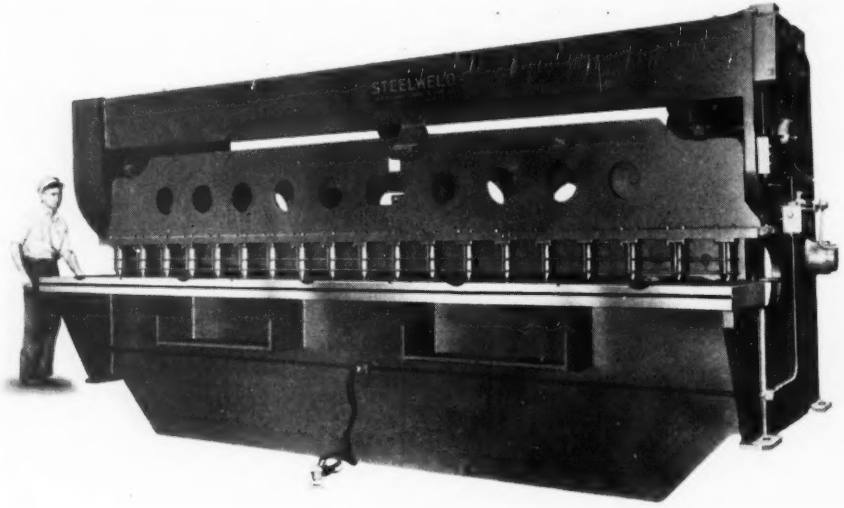


Shearing Machine

Said to be the longest Steelweld Shear built to date, the machine shown herewith, product of The Cleveland Crane & Engineering Co., 6401 E. 282nd St., Wickliffe, Ohio, has a capacity for shearing 18 feet of $\frac{3}{16}$-inch mild steel at 50 strokes per minute and operates on the pivoted-blade principle in which the blade travels in a circular path without the use of guides and slides.

Ball bearing transfers are provided in the bed of the machine to facilitate movement of steel through the knives. A motor-operated back gage with slow and fast control buttons located conveniently at middle front of the machine enables the material to be cut to be accurately positioned. An oblong slot in the hold-down beam permits the back gage indicator to be readily seen by the operator without having to walk to the end or rear of the shear. The indicator is graduated to read in inches and $\frac{1}{64}$ths.

The shearing action is controlled by an electrically-operated foot switch which



Steelweld Shear

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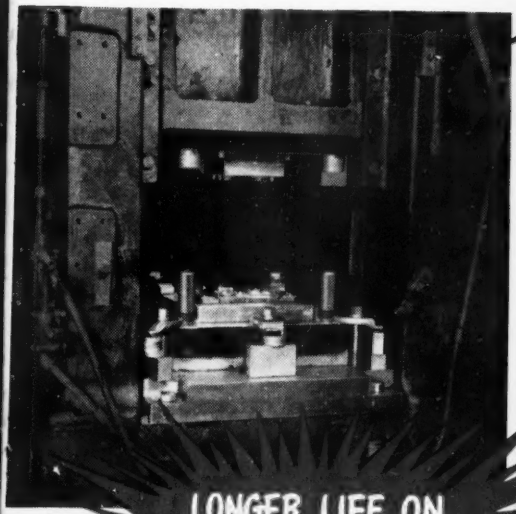
Die assembly work is easier and more accurate when it's based on reliable Danly precision.



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- * Long Island City 1, 47-28 37th Street
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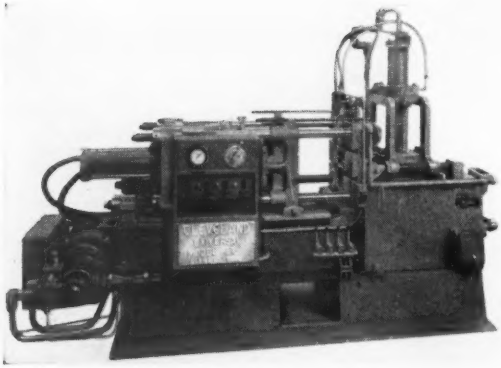


Cleveland Model 50 Die Casting Machine

ing aluminum castings up to 2½ lb. and zinc castings up to 4 lb., the machine can be supplied with either automatic or manual control and has die plates which are 22 x 18 inches and four tie bars which are 2 inches in diameter. The space between the tie bars is 16 x 12 inches, and the die opening is 8 inches. An estimated 50-ton locking pressure is said to be obtained through a toggle mechanism.

can be moved about the floor to the convenience of the operator. The frame and blade are of all-welded steel, one-piece construction with the heavy bed extending below the floor. The bed and crown are welded to the end housings, thus forming an integral unit having unusual strengths. Knife clearance can be readily adjusted to suit the thickness of plate being cut by simply turning a convenient handcrank and observing a large dial indicator.

Die Casting Machine

The Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio, has announced a high pressure hydraulic die casting machine, designated as the Model 50, which can be furnished either as a cold chamber unit for casting aluminum or as a gooseneck type of machine for casting zinc, tin, or lead. The one-shot end can be easily removed and changed to the other type end if desired.

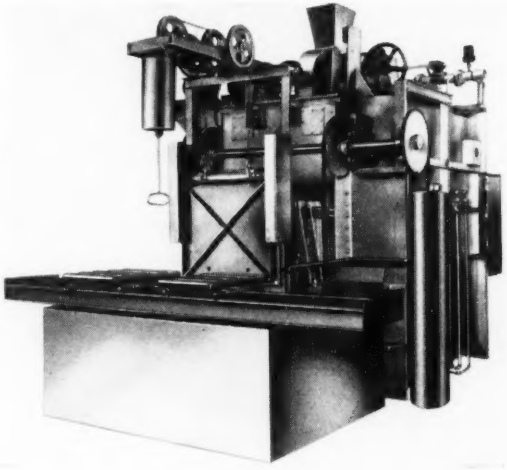
The machine is equipped with a Vickers two-stage pump driven by a 10 h.p. direct connected motor. The pump is designed to deliver 43 g.p.m. at the low pressure stage and 10½ g.p.m. at the high pressure or 500 p.s.i. stage. The hydraulic system also includes Vickers oil filters, a heat exchanger, and a 79-gallon capacity oil reservoir.

Said to be capable of produc-

Batch Type Furnace

Surface Combustion Corp., Toledo 1, Ohio, has developed a batch type radiant tube fired furnace designed for clean hardening, gas carburizing, dry cyaniding, and other controlled atmosphere heat treatments. Work is moved in and out of the furnace on four trays which are actuated by alloy screws. A lowerator quench mechanism is included which provides "semi-automatic" operation for the charging and discharging of the furnace.

Extremely fast heating rates developed by the use of radiant tube firing, combined with a fan to circulate heated, prepared atmosphere, are said to provide for the heat treatment of up to 200 lb. per hour gross loads per square foot of area. The furnace has a maximum gross



"Surface" Batch Type Radiant Tube Fired Furnace

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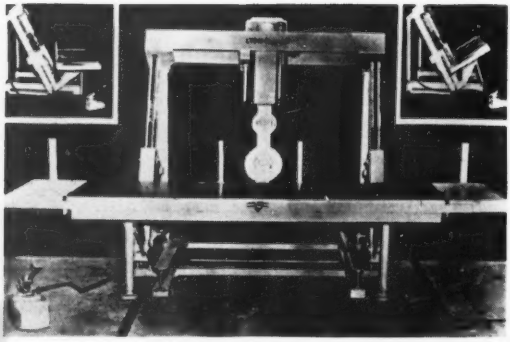


Lyon-Raymond Adjustable Tilt Hydraulic Sheet Feeding Table

charge capacity of up to 2,500 lb., depending upon the type of work to be processed. With the RX atmosphere generator built integrally with the furnace unit, a 16-foot long x 9-foot wide space is said to be adequate for the entire furnace.

Hydraulic Sheet Feeding Table

For raising up to 6,000-lb. loads of steel sheets and positioning the top sheet for feeding to an inclined press, the Lyon-Raymond Corp., 22553 Madison St., Greene, N. Y., has developed a stationary type table having an elevating platform 30 inches wide x 90 inches long. Two 15-inch end extensions are provided to increase the length of the platform to 120 inches. In the lowered position, the platform is level to facilitate loading. As an hydraulic foot pump is actuated, the platform first tilts and then elevates at an angle to position the top sheet to the press. Operating the foot pump as required is said to keep the top sheet always in feeding position until the entire pile is used.

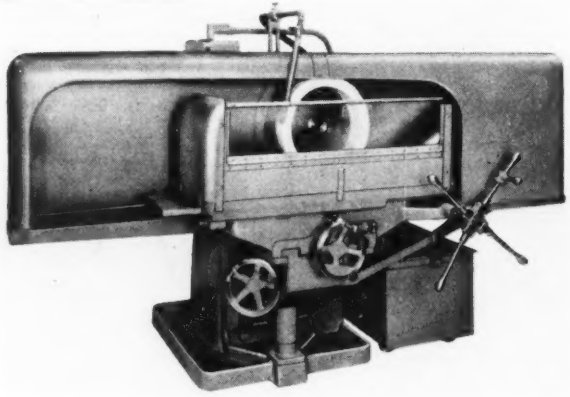
The elevating mechanism consists of an inverted ram, chain sprockets, and roller chain extending from a hoist to the elevating platform. In operation, the ram forces the sprocket bracket down, thus increasing the tension on the chain which first tilts the platform until it is at a right angle to the carriage channels and then elevates it. Backstops are fixed at right angles to the table top so that they will support the load in the tilted position without binding the top sheets.

Frame and carriage members are hinged. Three simple adjustments predetermine the amount of incline at which the platform elevates and the lowered height of the platform. Screws in the feet of the rear upright supports govern the degree of incline assumed by the carriage channels. The lowered height of the leveled platform is regulated by movable stops on the carriage channels and adjustable legs on the platform carriage.

Face Grinder

A face grinder with motorized spindle and 18-inch wheel has been announced by the Abrasive Machine Tool Co., East Providence 14, R. I. The 15 h.p., 900 r.p.m. motorized spindle is said to provide for the elimination of all pulleys and belts and to afford an unusually powerful drive. The spindle is mounted on preloaded ball bearings to ensure long life and chatter-free operation.

The grinder includes box-type ways to assure maximum rigidity. A large work



Abrasive 18-Inch Wheel Face Grinder

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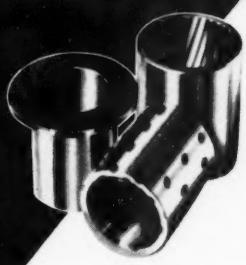
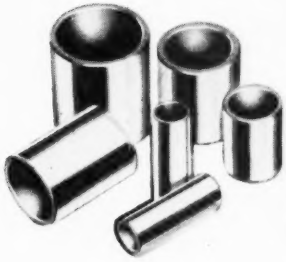


Graphited Bearings



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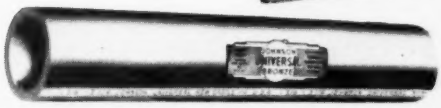


Universal Bronze

surface of 13 x 36 inches permits the use of the machine for practically every face grinding application where flat, square surfaces are required. Standard equipment of the unit includes complete coolant equipment with 60-gallon tank and unique table water-guards.

Vertical Jig Borer

Said to be the largest vertical type jig borer ever built, the P & W No. 4-E Jig Borer illustrated herewith, product of Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., is claimed to be capable of locating and boring to 0.0001-inch accuracy with a work load of 2½ tons. The 15-ton machine with its open-side construction provides convenience in placing and holding a wide range of work.

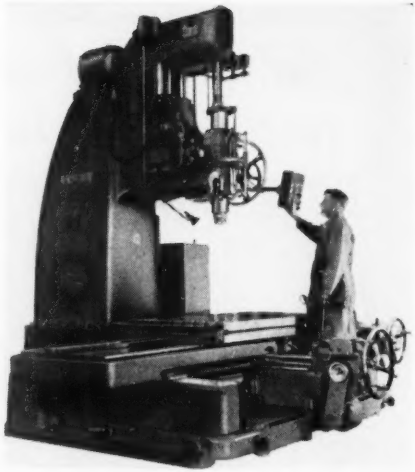
The No. 4-E has a 36 x 72-inch rectangular table with longitudinal travel of 60 inches and transverse travel of 36 inches. The maximum standard height from table top to spindle nose is 33 inches; however, columns 6, 10, and 14 inches higher than standard can be furnished, increasing the vertical capacity to a maximum of 47 inches. A combination rectangular and built-in 42-inch diameter rotary table or a built-in 48-inch rotary table can be furnished in place of the plain rectangular table.

Tools as large as No. 5 Morse taper may be held in the spindle with collets and a spindle nose cap. The 5½-inch diameter hardened, ground and lapped quill has a 10-inch vertical travel with power feeds (both up and down) ranging from 0.0005 to 0.015 inch per revolution of the spindle. An adjustable dial indicator depth gage with positive stop is built into the spindle head for accurate boring to depth.

Electrical controls of the primary functions of the machine are concentrated in a pendent control which is located at the normal operating position and is adjustable to suit operating conditions. Push-button controls and selector switches are provided for spindle motor speed selection; spindle start, stop and reverse; spindle clutch and brake; spindle head (verti-

cal power movement with automatic clamping and unclamping); longitudinal rapid power travel of table for quick positioning; and carriage and table power feed selection from 1 to 15 inches per minute. In addition to the controls on the pendent box, push buttons are also located on both carriage and table control brackets for controlling rapid power travel when positioning the work in both longitudinal and transverse directions.

An electric control cabinet located at the right of the machine contains a main disconnect switch, all starters, relays, electronic and other electrical apparatus necessary to the operation of the machine. The floor space occupied by the entire machine and control cabinet is approximately 12½ feet wide x 11 feet deep. The approximate overall height of the machine (using highest column) is 12 feet.



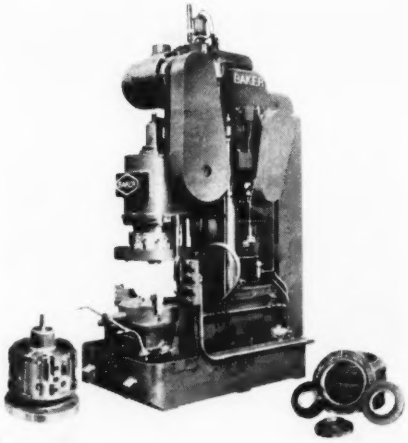
P&W No. 4-E Jig Borer

Machine Tool for Pipe Flanges

For boring, reaming, threading, and counterboring cast iron pipe flanges on a high production basis, Baker Brothers, Inc., Toledo 10, Ohio, is offering the Baker 30HO4 Machine illustrated herewith, which is equipped with a three-jaw scroll and chuck and is designed to handle all sizes of flanges from 3 to 16-inch pipe size. Murchey special full receding

pipe taps with quick-change chasers and reamer blades are used to perform the boring, reaming, threading, and counterboring operations in rapid succession. The machine has a worm and worm gear drive head and is arranged with sliding gears providing two speeds, plus pick-off speed change gears.

The operating cycle of the machine is as follows (1) The saddle is rapid advanced through hydraulic pressure to a predetermined point where the taper reaming operation begins. (The cycle is controlled through limit switches.) (2) Half nut closes, providing positive lead screw feed of the saddle for reaming, tapping, and counterboring operations. (3) At the completion of operations, the half nut opens and the saddle is rapidly returned to raised position by hydraulic pressure.

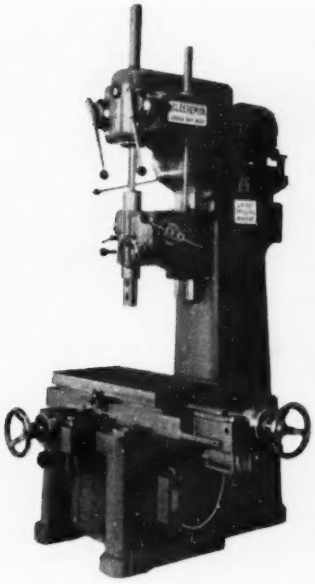


Baker 30HO4 Machine for Pipe Flanges

Layout Drilling Machine

For maximum convenience in performing drilling, boring, tapping, reaming, milling, and similar operations, the Cleereman Machine Tool Co., Green Bay, Wis., is offering the layout drilling machine illustrated herewith. The machine is said to be especially applicable to tool work, die casting molds, and blanking, punching, forming, and drawing dies within its designated limits, as well as experimental work and small-lot manufacturing.

The unit features a combination boring and drilling spindle having a No. 4 Morse taper with lifetime lubrication. Preloaded ball bearings are used at the nose end with an upper steadying ball bearing and a coupling type connection provided between the spline shaft and the spindle in the top of the quill. The spindle quill is chrome plated, and the rack is ¼ pitch. The tang slot has a hardened steel insert. A spindle binder on the sliding head



Cleereman Layout Drilling Machine

and a retaining key slot in the spindle provide for milling operations. The sliding head has a friction type feed clutch with automatic adjustable depth "kick-out," and the spindle is counter-balanced in a unique manner that is said to eliminate backlash between the spindle feed rack and pinion.

The movements of the saddle and table are controlled by hardened and ground precision lead screws with 6-inch diameter micrometer dials graduated to 0.001 inch and verniers of 0.0001 inch. Additional standard features include reference scales graduated to eighths and having adjustable pointers for quick, convenient reference, and "one-shot" lubricating system for the table, saddle, and bed

mechanism. Power rapid traverse to table movements is an optional feature, with automatic safety stops provided at the extremes of travel.

Shearing Die Attachment

Diamond Machine Tool Co., 3429 E. Olympic Blvd., Los Angeles 23, Calif., has announced a shearing die attachment to be used for shearing applications in Diamond "Multi-Max" punch presses. With the attachment, a Model 3048 Multi-Max punch press is said to be easily converted into a 10-gauge 48-inch power squaring shear in approximately 15 minutes.

Shearing Die Attachment for Diamond "Multi-Max" Punch Presses

The shearing die attachment is equipped with adjustable front and back gauges which are of identical design as used on Diamond power squaring shears. Hold-downs are of one-piece construction, stripper type spring loaded. The attachment utilizes alloy steel blades which have four cutting edges and are heat treated and ground to extreme accuracy. The attachment is mounted in an all-steel die set with two 2-inch diameter hardened and ground leader pins. Cutting length is 48 inches and cutting thickness is 10 gauge. Slope per foot of blade is $\frac{3}{8}$ inch. Back and front gauges each have a maximum range of 24 inches. The net weight of the attachment is 1,075 pounds.

Belt Grinder

Known as the "Expeditor," a belt grinder which can be set at any desired angle has been announced by Harvey L. Ramsay & Co., 636 S. 10th St., La Grange, Ill. The unit is mounted on an axis that centers at the motor shaft, and, with one turn of a

"Expeditor" Belt Grinder in Use

of a clamp nut, the abrasive belt can be set at any required angle.

If desired, several Expeditors can be set above each other so that the contact wheels or platens of the units may be directly in front of the operator. In this setup, the operator can rough, semifinish, and finish grind with little movement. The grinder can also be used alongside of milling machines, band saws, hack saws, automatics, and other machine tools for deburring workpieces, removing cutter tool, or saw marks, breaking corners, rounding out contours, and other clean-up operations.

The Expeditor is designed for free belt operation, form wheel work or contour grinding, line contact grinding, and platen precision grinding, either above or below. The unit includes a front contact roll made of aluminum and a drive belt that serves as a resilient or cushion.

Press-Broach

Bearing the designation KRW, an hydraulically operated combination press-broach designed for "push-pull" operation in either a vertical or horizontal plane has been made available in 25, 50, and 60-ton capacities by K. R. Wilson, 215 Main St., Buffalo 3, N. Y. When used as a broaching machine, tonnages can be varied from one ton to the capacity of the unit. The ram stroke range varies from 7 to 54 inches. Ram speeds and maximum tonnage pressures depend on the type and capacity of the motor and hydraulic pump equipment supplied of which there are ten units from which to choose.

The pressure gage, located at eye level,

is equipped with a pressure dampener to prevent damage resulting from sudden pressure stops. A pressure regulating valve permits the selection of any desired pressure within rated capacity. A manually operated four-way valve provides for instant and precise finger-tip control of the ram. The hydraulic system includes a 20-gallon capacity reservoir from which the hydraulic fluid is distributed through seamless steel tubing. The pumping unit may be located either in the base or at the top of the machine. All electrical controls are standard. Cutting oil is supplied through an independently motorized coolant pump from a 15-gallon reservoir.

KRW Combination Press-Broach

For push broaching, an adapter is screwed into the upper cross bar, the broach is inserted and held by a slot and key. For pull broaching, a similar adapter is inserted in the lower cross bar. A flat nosed adapter is furnished for attachment to the upper cross bar to allow for the handling of many types of pressing and forming jobs.

Adhesive

A thermosetting resin compound for joining metals and numerous other rigid materials to themselves and to each other is now being manufactured under the name of Armstrong's Adhesive A-1 by the Armstrong Products Co., 387 N. Broadway, Burket, Ind. The compound, it is claimed, contains no volatile solvent, does not shrink or swell upon hardening, sets up to a rigid solid, and becomes the adhesive bond between the materials to which it is applied. Since the adhesive contains no volatile constituents, it can be used as a gap-filling material and also enables materials that are to be bonded together to be assembled immediately after application of the compound.

According to the manufacturer, Armstrong's Adhesive A-1 has been used successfully to bond aluminum alloy spacers to steel discs in magnetic fluid clutches operating at temperatures as high as 200 deg. F.; to bond steel housings to steel in large bearings; to repair broken aluminum castings; and so on. The adhesive is available in pint, quart, gallon, and five-gallon containers.

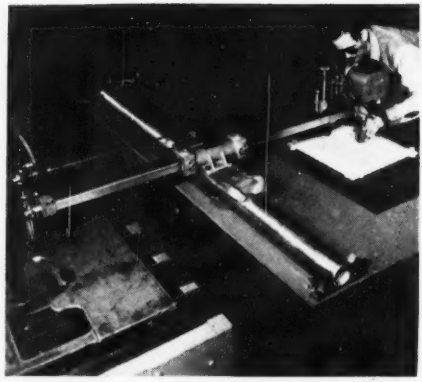
Shape Cutting Machine

Designated as the Airco Monograph No. 3, a precision shape cutting machine for shops of all sizes is now being marketed by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. The machine is said to cut any shape, within a 56 x 32-inch area, that the operator can follow on a drawing, outline, or template. The tracer wheel is motor driven at any speed from 3 to 30 inches per minute and, on shape cutting, is manually guided.

Straight cuts up to 64 inches long can be made by the use of a grooved straightedge supplied with the machine. Lengthwise cuts longer than 56 inches can be handled by adding extra 80-inch lengths of tubular rail. Circles up to 32 inches in diameter may be cut automatically. A radius rod supplied with the

machine attaches to the tracer device and guides the cutting. Using a suitable tip, the machine is said to cut any ferrous metal in thicknesses up to 8 inches and to make bevel cuts at any angle up to 30 degrees.

All operating controls are conveniently centralized at the tracing end of the machine, which is supplied in a single carrying case complete with cutting torch and high speed tip, motor-driven manual tracing device, one 80-inch length of tubular rail, a 66-inch grooved straightedge for making straight cuts, a radius rod for cutting circles; 25 feet of extension cord, and 25 feet of Airco-Twin Hose. According to the manufacturer, the machine is light enough to be easily carried by two men. The machine and rail together weigh 250 lb.; the machine itself weighs 110 lb. assembled.

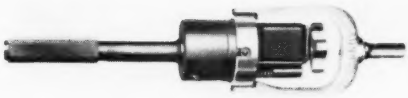


Airco Monograph No. 3 Shape Cutting Machine in Use

Portable Honing Head

Known as the "Honall," a portable honing head for use with a portable drill, lathe, or drill press in sizing and finishing holes has been announced by the Sunnen Products Co., 7983 Manchester Ave., St. Louis 17, Mo. The head is recommended for generating round, straight holes with accuracy as desired (to one ten-thousandth of an inch) and with surface finish as fine as 2 micro-inches r.m.s. in hardened steel.

Designed for honing holes from 3/16 to 1 inch in all metals (except lead and babbitt), the Honall utilizes standard



Sunnen "Honall" Portable Honing Head

Sunnen honing mandrels and may be employed for removing distortion after hardening or after assembly of parts; salvaging parts with defective holes; sizing and finishing dowel pin, header and ejector pin holes and holes in extrusion dies; making machine repairs without complete disassembly; and for many other sizing and finishing applications. It is said to be equally convenient for removing several thousandths of stock or only the "last tenth" for an exact fit.

Moisture Control Desiccants

Celler Engineering Associates, 115-21 Farmers Blvd., St. Albans 12, N. Y., has announced that Celler's Engineered Hydroscopic Desiccants are now being packaged for the manufacturer with small to medium size tool cribs or rooms and other locations requiring vapor and moisture control for the prevention of dampness, rust, mold, mildew, and corrosion on metals and other materials. The desiccants are in bead form and, it is claimed, do not disintegrate when used and show no dusting at any time.

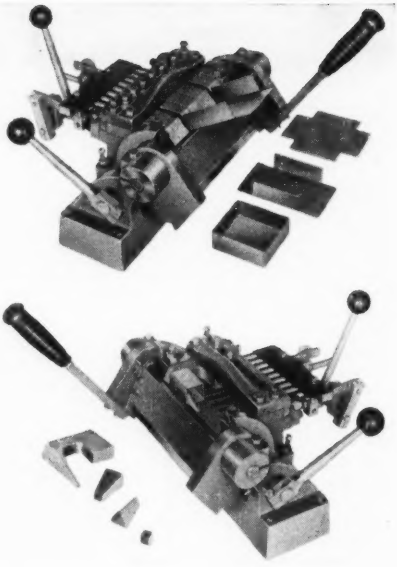
Celler's Engineered Hydroscopic Desiccants are packaged in perforated aerated cans of various sizes for complete circulation of moisture-laden air in and around the container. This method of packaging is also said to eliminate the necessity of repackaging for use and the need of changing the package for reactivation and recovery.

Precision Box Fingers

The O'Neil-Irwin Mfg. Co., 306 Eighth Ave., Lake City, Minn., has announced that all of its "Di-Acro" brakes can

now be quickly converted into a precision box and pan brake by merely using a newly developed box finger bar in place of the solid top bar supplied with all standard Di-Acro brakes. The box finger bar contains fingers graduated in size so that they cover the entire box forming range from ½ inch to the maximum capacity of each model Di-Acro brake by ⅛-inch steps. All fingers are properly hardened, precision ground, and accurately mounted against a machined surface in a sturdy alloy casting which provides extreme rigidity over its entire length.

The rigid construction of the box finger bar also allows full capacity forming over its entire length, thus enabling the bar to be used for a wide variety of operations other than box forming. The bar can be readily mounted on all Di-Acro brakes now in use and is furnished complete with a new "Adjustomatic" box depth gage. Another accessory which can be mounted on the box finger bar is a special open end finger that allows for the forming of triangular, square, and rectangular tubes, as well as other similar parts which entirely enclose the form-



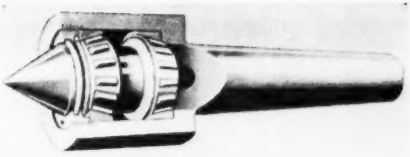
(Above)—"Di-Acro" Box Finger Brake with "Adjustomatic" Gage, (Below) — Open End Finger Mounted on "Di-Acro" Box Finger Brake

ing bar since the piece can be slipped off the open end of the finger when completed.

Live Center

Said to handle heavy loads at high speeds with extreme accuracy, a live center for lathes and other machines has been announced by Scully-Jones & Co., 1909 S. Rockwell St., Chicago 8, Ill. Available in Nos. 2, 3, 4, and 5 Morse taper sizes, the center features two matched standard Timken tapered roller bearings with eccentricity points aligned for accurate anti-friction rotation. Designed to provide large bearing surfaces to withstand shock loads and abuse, the center is claimed to assure long life and high load carrying capacity (up to 1,000 lb. in the Nos. 2 and 3 Morse taper sizes and up to 2,400 lb. in the Nos. 4 and 5 Morse taper sizes). A threaded retainer ring for preloading bearings is said to provide for maximum rigidity as well as adjustment for wear.

The spindle of the unit is of alloy steel hardened to 64 Rockwell C. The point is ground in its own bearings after assembly to assure the holding of runout of within 0.0002 inch total indicator reading. The shank is induction hardened to provide for maximum strength and resistance to wear and is precision ground for an accurate fit. A heavy duty grease seal is incorporated in the threaded retainer ring. A rotating Neoprene ring is claimed to form an efficient labyrinth seal against the entrance of grit or chips. A grease port with ⅛-inch pipe thread is provided in the rear of the shank for a standard hydraulic grease fitting. This port

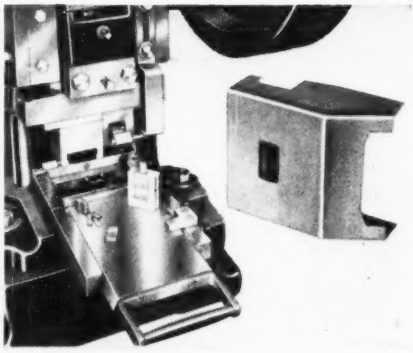


Scully-Jones Live Center

also allows for the insertion of threaded rod to rotate the spindle when redressing the point.

Press Numbering Assembly

A press assembly which is designed to permit the stamping of serial numbers and repeat markings simultaneously has been placed on the market by The Acromark Co., 9 Morrell St., Elizabeth 4, N. J. A combination slide style interchangeable type holder and consecutive action automatic numbering head makes up the upper portion of the assembly. The lower portion consists of a hand-operated slide that feeds name plates or flat parts underneath the stamping assembly. The hand slide is so constructed as to feed name plates or parts individually or, if the name plates or parts will stack and "push-off" from the bottom, the slide will feed them in sequence by having each plate push the preceding one from the bottom of the stack.

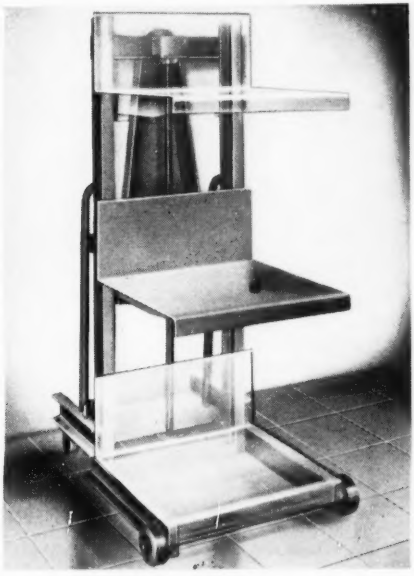


Acromark Press Numbering Assembly

As illustrated, the unit requires hand placing of each individual plate onto the slide, however, a magazine can be readily added to permit stacking. The entire assembly is mounted in a standard die set for assembly in a precision power press that will deliver sufficient pressure for the marking. Length of stroke is 1 inch and die-set size is 7½ inches high with 1-inch diameter x 2-inch long shank. The width is 12 inches and the depth, 6 inches. The interchangeable type used is a heavy duty shoulder style that is held in the holder by a shoulder which increases the strength.

Stacker

The stacker shown herewith is now being offered as a standard unit in the "Portelvator" line of lifting, positioning, and transporting equipment manufactured by The Hamilton Tool Co., 828 S. 9th St., Hamilton, Ohio. It is of fabricated construction throughout and has a load capacity of 1,000 lb. The maximum height of platform surface from floor is 58 inches; minimum height, 6 inches. Ac-



"Portelvator" Stacker

cording to the manufacturer, the platform automatically locks at any position stopped and cannot slip or "settle" under the load. The platform measures 26 inches from side to side and 24 inches from front edge to protective back plate.

Platform movement is accomplished through a handcrank, roller chain, meshing bevel gears, and screw. This method of power transmission is said to endow the platform with maximum rigidity and provide the operator with a full measure of safety. Provision is made for extra rapid platform movement under light loads.

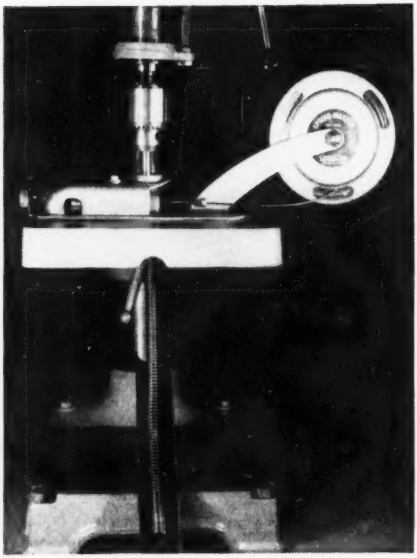
The Portelvator Stacker is 70 inches high x 32 inches wide x 42 inches long overall and weighs 328 lb. It is equipped

with ball bearing casters which are 4 inches in diameter x 1½-inch face, and roller bearing wheels 5 inches in diameter x 2-inch face. A floor lock is standard equipment. Rubber-tired wheels and casters can be furnished if specified, and other special characteristics can be incorporated on order.

Spring-Making Attachment

Said to readily convert a ½-inch drill press into an efficient high speed spring-making machine, an attachment to be known as the "Spring-Master" has been developed by the Cycloid Corp., 12 Newhall Ave., Saugus, Mass. The attachment can be obtained with three sizes of spindles with capacities for wire from 6 gauge (0.016 inch) to 28 gauge (0.071 inch). The outside diameter of finished springs can be made to vary from 3/16 to ⅝ inch. Special spindles can be provided for producing springs of other outside diameters.

The Spring-Master can be quickly set up on any standard ½-inch drill press by simply fastening it onto the drill press table with one bolt which extends through



Cycloid Standard Model "Spring-Master" Installed on Drill Press

one of the slots in the table. The same bolt holds the wire container in place. This container is designed to accommodate any 1-lb. standard package of wire.

An outstanding advantage of the Spring-Master is the fact that the pitch of springs being made can be infinitely varied to suit the application while the equipment is in operation. This is accomplished by simply moving the handle of the drill press up for an open pitch spring and down for a closed pitch spring. The length of springs is governed only by the length of wire used. The standard model is furnished complete with two 1-lb. packages of spring wire.

Work-Holding Tool

Known as the "In-R-Tool," a work-holding device that can be readily used in lathes, vises, boring mills, on machine tables and in fixtures, as well as in electric drills and drill presses, is now being manufactured by the Layne-Held Corp., 2005-K S. Shelby St., Higginsville, Mo. The inner pressure tool includes an arbor for a center member which is machined within accurate limits. Interchangeable cores and pressure members that fit the splines of the cores are provided. The cores cover a range from 1¼ to 2¾ inches and have N. C. ¾-10 precision threads. A ratio-limiting collar controls distortion of thin work. This collar regulates the expansion of the pressure members which, in turn, hold the work firmly in place.

The In-R-Tool can be used as an expanding arbor when working between lathe centers or when inserted in chucks or collets. It can also be used to make thin spacers from plate. When used as an anchor, the tool acts as an inside self-centering chuck. In welding shops, the device can be employed to accurately align the interior and exterior of pipe and other objects to be joined.

Referring to the accompanying illustration, the short-work In-R-Tool shown in the foreground has a range of from 1½ to 2¼ inches. The complete kit with all

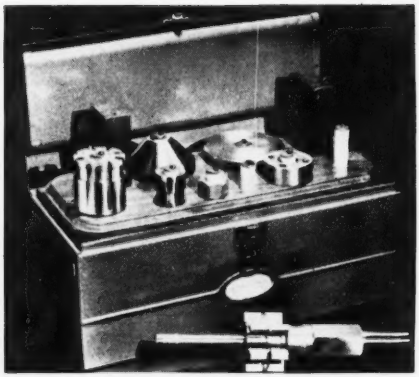


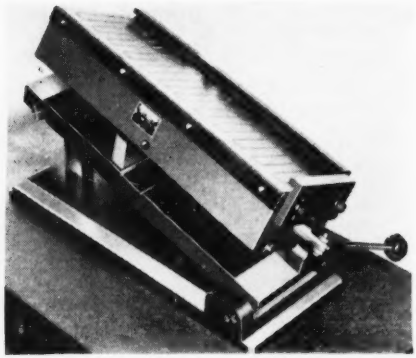
Illustration Showing Short-Work "In-R-Tool" (Foreground) and Complete "In-R-Tool" Kit

accessories covers a range from 1¼ to 2¾ inches. Special sizes of the tool can be obtained on order.

Magnetic Angle Plate

Designed for use on production-type surface grinders, the Robbins 20-Inch Series Magna-Sine shown herewith, product of the Omer E. Robbins Co., 5722 Twelfth St., Detroit 7, Mich., has a permanent-magnet chuck measuring 7½ inches deep x 20½ inches long and can be used for either wet or dry grinding. With the Magna-Sine in closed position, it may be used as a conventional magnetic chuck for holding parallel work. For

Robbins 20-Inch Series Magna-Sine



angular jobs, either single angle or compound angle, the unit can be quickly and accurately set up with standard gage blocks by the sine bar method.

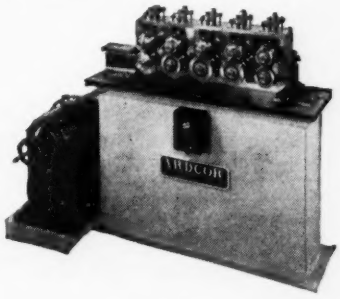
The Robbins 20-Inch Series Magna-Sine is sturdily built for production use and carefully machined and constructed for absolute angular accuracy.

Roll Forming Machine

Designated as the "Ardcor" Type H, a roll forming machine which is said to form, curve, emboss, and cut in one continuous operation is now being built in standard sizes to accommodate material up to 5 inches wide and 20 gauge thick by the American Roller Die Corp., 20504 St. Clair Ave., Cleveland 17, Ohio. Machines of larger sizes for material up to 50 inches wide and $\frac{5}{8}$ inch thick may be supplied on order.

Molding, beading, metal roofing, automotive parts, tubing, weather stripping, and various other products may be formed on the Ardcor Type H, which is of outboard or overhung design with all-steel construction, including base and housings. The machine may be provided with any number of spindles for handling material of various widths. Speed in feet per minute varies from 50 to 300.

A time-saving feature of the Type H is the method of adjusting the top spindles. Two adjusting screws are provided for each top spindle, these screws being connected in such a manner that by turning either one of them the top spindle is raised or lowered, maintaining a parallel relationship with the bottom spindle. Precision ball bearings are employed

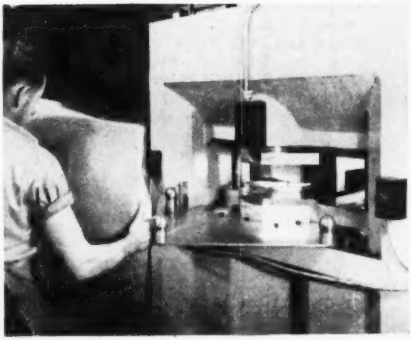


"Ardcor" Type H Roll Forming Machine

throughout the machine, the bearings being provided with Alemite lubrication fittings. All of the roll spindles are chrome-nickel steel, h a r d e n e d and ground. All gears are heat treated and are fully enclosed in the housings of the machine.

Corner Draw Press

The Vulcan Tool Co., 731 Lorain Ave., Dayton 10, Ohio, has announced the development of a "one-corner-at-a-time" hydraulic drawing press known as the "Vulcan-Draw." In operation, the flat sheet is placed in position (one corner) in the press and the operator steps on an actuating pedal. In the normal few seconds hydraulic cycle, the sheet is released with the corner completely drawn and finish sized. By rotating the sheet, the other corners can be formed with specified overall panel dimensions maintained.



"Vulcan-Draw" Corner Draw Press

Since only one corner is dealt with at a time, various corner radii covering different styled panels can be fabricated in the same equipment. The tooling consists of a simple corner punch and die which can be changed at will and within a few minutes if a differently shaped corner is to be formed. Different panel sizes of the same style or product can be formed by the same die. Practically any radii and any size panel from 15 x 18 inches up to the maximum capacity of the press can be economically corner formed from the flat sheet as received from the steel mill source, it is claimed.

Electrode for Steel

"Steel-Tectic," a high speed electrode for steel which is said to weld bead over bead without the need for removing slag, is now being marketed by the Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y. According to the manufacturer, the $\frac{5}{32}$-inch electrode can be used at as low as 50 amperes on thin steel without danger of burning through, yet for piecework production may be employed at high amperages as a thin depositing electrode with a very short arc.

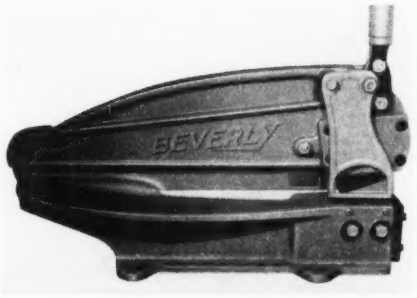
Designed for use in a vertical, horizontal, or downward position, the electrode utilizes a flux coating, designated as Eutectic Frigid-Arc, which is said to form a protective envelope around the weld area, thus permitting a spray deposit free of weakening oxides and inclusions.

Inside Slotter

A portable hand-operated deep throat inside slotter designed for fast, accurate inside slotting and punch operations has been introduced by the Beverly Shear Mfg. Co., 3000 W. 111th St., Chicago 43, Ill. The unit has a shearing capacity for mild steel up to 16 gauge.

The slotter utilizes a unique punch and die arrangement of five high carbon, high chromium cutting blades. The four lower blades, arranged in a rectangular shape to form a die, provide maximum support for the shearing action of the fifth or upper blade as it is brought down through the metal and into the cavity formed by the lower blades. All five blades are adjustable to compensate for wear and various thicknesses of metal being cut. A slot $2\frac{1}{2}$ inches long x $\frac{1}{8}$ inch wide can be cut at one stroke of the unit. An upper blade for cutting a slot $\frac{1}{8}$ inch wide is available on special order. If desired, a continuous cut, during which the work may be pivoted at any point of the stroke, can be made on the unit. The point of the $2\frac{1}{2}$-inch long upper blade is 8 inches from the throat, thus enabling an inside cut of up to $10\frac{1}{2}$ inches long to be made.

Rigidly constructed of lightweight high



Beverly Inside Slotter

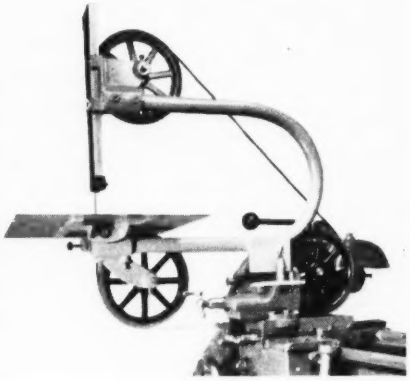
strength aluminum alloy, the slotter is 18 inches long x 9¼ inches high (less handle) and weighs 17½ pounds.

Lathe Saw Attachment

Designed to fit all lathes with from 9 to 16-inch swing, as well as all milling machines, a band saw attachment with capacity of 8 x 18 inches is now being marketed by Alois Steiner, 1014 Washington St., Hoboken, N. J. The attachment, which can be made portable if desired, is available in larger capacities on order.

The attachment includes a 14 x 18-inch tiltable steel table and a double extra heavy steel pipe frame. Recommended for use with saw blades up to ¾ inch wide x 80 inches long, the attachment is equipped with pulleys each having a special heavy gum rubber liner on the crown to minimize saw blade breakage.

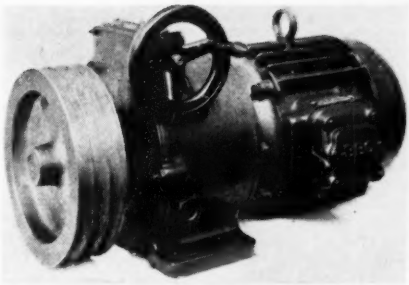
Steiner Lathe Saw Attachment



Infinitely Variable Transmission

The Beier Infinitely Variable Transmission now being marketed by the International Corp., Ltd., 19 Ebury St., London, S.W. 1, England, includes features of compactness, lightness, and high mechanical efficiency achieved by transmitting the power through a large number of points of frictional contact. As a result of this construction, the actual load at each individual point is very small and even when using copious lubrication to prevent wear, the necessary torque can be obtained with low mechanical pressures, it is claimed. These low pressures also permit high rotational speeds which are said to still further reduce the loading.

To obtain a large number of points of contact in a compact space, the frictional members used are discs. According to the manufacturer, due to the low pressure between the discs, the oil film remains unbroken at the points of contact so that even under the heaviest loads there is no wear on the frictional surfaces since there is no actual metallic contact. At all speeds, the efficiency is said to remain practically constant at between 85 and 95 per cent. An additional advantage claimed for the unit is its resistance to transmission shocks. It is stated that overloads can be sustained by the transmission for several minutes with 25 per cent slip without causing excessive overheating or wear.



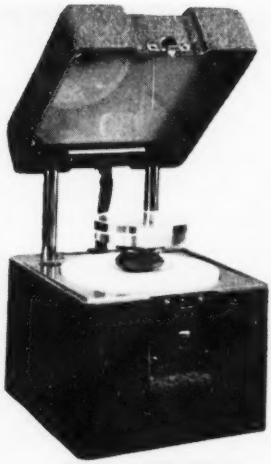
Beier Infinitely Variable Transmission

Monochromatic Light and Optical Flat

A precision-measuring monochromatic light and optical flat for checking flatness accuracy to less than one light band

(0.0000116 inch) are now being marketed under the "Lapmaster" trade name by the Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill. Originally developed to check the extreme accuracy of parts lapped on the company's lapping machines, the monochromatic light is said to be equally effective for checking the light band flatness of any Super-finished surface.

The light is designed to provide better than 25 foot-candle power illumination on the checking surface. Its helium gas filled tubular light is recessed into the cover and diffuses light through a flashed opal diffusing glass. Light transmitted is a strong, near one-color light of 11.6 millionths of an inch per dark interference band. The light source and checking stage are completely self-contained in a sturdy aluminum case. The unit is readily movable by means of an attached handle and is adjustable from the stage type to a bench type by rotating the head 180 degrees.



"Lapmaster" Monochromatic Light with Optical Flat in Stage-Type Position for Light Band Flatness Reading

Made of high quality natural quartz, the Lapmaster Optical Flat, it is claimed, is highly transparent, has unusual wear characteristics, is abrasion resistant, and will withstand thermal shock. The flat is available in 1/10 and 1/5 light band types with accuracies of 0.00000116 and 0.00000232 inch respectively and in sizes ranging up to 6 inches in diameter.

Whitman & Barnes Bit Stock Drill Set

Bit Stock Drill Set

Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich., is marketing bit stock drills in sets which are contained in attractive plastic cases, the bottom part of each case being bright red and the hinged top transparent. The drills are offered in three sets as follows: No. 13 containing 9 drills from 1/8 to 3/8 inch in diameter; No. 13A containing 7 drills from 1/8 to 3/8 inch in diameter; and No. 13B containing 9 drills from 1/8 to 1/2 inch in diameter.

Hard Solder Alloy

A hard solder type alloy for joining aluminum to steel, bronze, and copper as well as aluminum has been announced by the Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y. Of interest to manufacturers of electrical aluminum units, delicate or thin gauge parts, the low-melting high strength alloy, known as Eutec-Rod 192, is available in 1/16, 3/32 and 1/8-inch coil form and is recommended for sealing cracks, spot welds, and the general soldering of aluminum. It is said to be especially useful where a solder as white as possible is desired.

According to the manufacturer, Eutec-Rod 192 has a bonding temperature of 650-700 deg. F. and provides a tensile strength of 11,000 p.s.i., together with good corrosion resistance and excellent electrical conductivity. It is used with Eutector Flux 192, which acts as a temperature indicator. When the flux begins to smoke, the alloy is applied and spreads out rapidly throughout the entire joint.

A clean, smooth weld without any damage to the base metal is claimed to be provided by use of EutecRod 292.

Pneumatic Grinder

A 15-oz. pneumatic grinder for the operation of grinding wheels of ½-inch diameter and smaller has been announced by the Keller Tool Co., Grand Haven, Mich. Designated as the 30A-7, the tool is compactly constructed, thus making it particularly useful for grinding in close quarters or where intricate designs permit only the use of very small grinding wheels.

Said to be ideal for touching up dies and similar tedious jobs, the grinder has a speed of 75,000 r.p.m. and is provided with a housing that is designed to fit in the hand comfortably. An inverted throttle lever provides for convenient operating control. The standard spindle collet of the tool accommodates mounted grinding wheels with ⅛-inch diameter shanks. Optional equipment includes spindles with $\frac{3}{16}$ or ¼-inch capacity collet chucks.

Keller 30A-7 Pneumatic Grinder

Self-Locking Set Screw

Known as the "Zip-Grip," a self-locking set and adjusting screw which is said to require no supplementary locking devices for efficient use has been announced by the Set Screw & Mfg. Co., 152 Main St. Bartlett, Ill. According to the manufacturer, the screw is specifically designed for set screw applications in which excessive vibration is a factor and for regulating and adjustment ap-

plications in which instantaneous locking at a precise point is desired.

The Zip-Grip provides a triple-locking

"Zip-Grip" Self-Locking Set Screw

action through a combination of interference fit, tension, and the locking of the set screw against the shaft or other part. As shown in the accompanying illustration, the lower part (B) of the screw, which enters the hole first, has a standard thread, while the upper part (A), designated as the "activating area," has a larger pitch diameter of the thread section which creates an interference fit or expansion effect against the thread flanks. This results in a tension or opposed-force action, causing the thread section of the upper part to be drawn downward and that of the lower part to be drawn upward in the direction of the locking action of the screw against the shaft.

The Zip-Grip Self-Locking Screw is available in all metals, including soft or hard steel (case hardened or heat-treated), stainless steel, brass, bronze, or aluminum. It may be obtained with any type of head to meet the particular requirements of the user.

Sheet Metal Perforating and Notching System

A system for perforating and notching sheet metal on a fast, efficient basis has been announced by the Wales-Strippit

Corp., 345 Payne Ave., North Tonawanda, N. Y. The system, which may be used in connection with both stamping presses and press brakes, consists of Wales self-contained units for perforating and notching operations; a T-slotted mounting base; a master template which is placed on the press bed and has pilot pin holes located over the entire surface area in the same pattern as the perforations in the finished piece of work; and set-up templets which are marked with the operation number and punch size and are placed on top of the master template to identify the pilot pin holes to be used in each operation. The number of operations on each part depends on the quantity, size, and position of perforations.

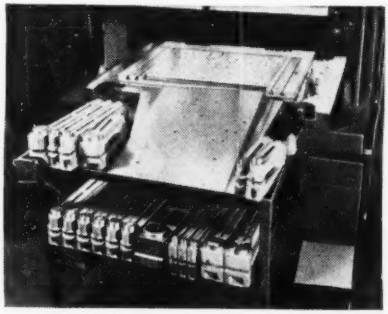
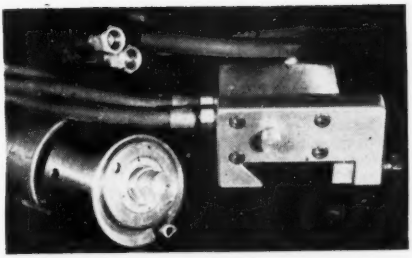


Illustration Showing the Four Elements of Wales Perforating and Notching System: (1) T-Slotted Mounting Base, (2) Master Template, (3) Set-Up Templates, and (4) Hole Punching Units

According to the manufacturer, the Wales perforating and Notching System permits the use and reuse of the same group of units in unlimited setups on the master template.

Hydraulic Diamond Turner

Designed specifically for use on Cincinnati centerless grinders, a hydraulic diamond turner designated as the Citco Model 1001-A is now being produced by the Cleveland Industrial Tool Corp., 1080 E. 222nd St., Cleveland 17, Ohio. The device is constructed to automatically reposition the diamond by hydraulic means. The turning operation is controlled by a valve which is automatically opened by the dresser unit.



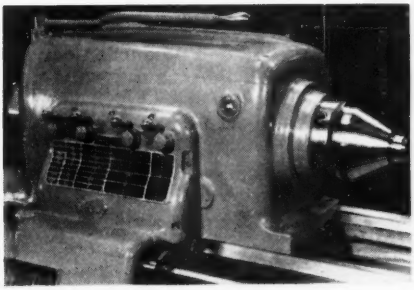
Citco Model 1001-A Hydraulic Diamond Turner

According to the manufacturer, the Citco Model 1001-A Hydraulic Diamond Turner is built to turn the diamond 3 degrees which is sufficient to present a sharp new cutting edge on the diamond and yet does not change the amount dressed off of the grinding wheel. All moving parts of the unit are hardened and ground. Rubber "O" rings are used on all diameters, and all tolerances are claimed to be held very close. Once installed, the device is said to require no further maintenance.

Lever-Operated Collet Attachment

The Monarch Machine Tool Co., Sidney, Ohio, has developed a lever-operated collet attachment providing up to 1⅛-inch round bar stock capacity for application on all Monarch Series 60 engine and toolroom lathes. Suitable for installation on these machines at the factory only, the attachment is so designed that it can be used for either draw-in or pusher-type collets. Both types are identical except

Lever-Operated Collet Attachment for Monarch Series 60 Engine and Toolmaker's Lathe

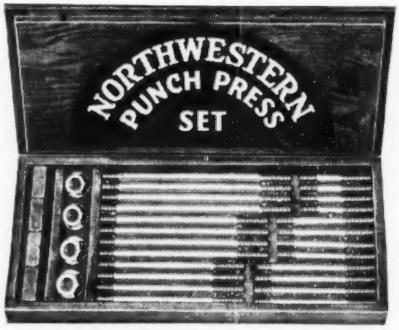


for the drawbar, collets and spindle nose adapter, thereby assuring quick conversion by the user from one type collet to the other.

Removal of the drawbar is said to be easily accomplished when the lever-operated collet attachment is in use. Also, the relation between the attachment and the collet itself can be adjusted readily from the exterior of the machine at the left-hand end of the headstock. The operating lever, extending up over the top of the headstock, is positioned conveniently to the operator standing in his normal operating position.

Punch Press Set

The Northwestern Tool & Engineering Co., 119 Hollier Ave., Dayton 3, Ohio, has added a punch press set to its line



Northwestern Punch Press Set

of toolmaker's products. The set consists of 4 studs of each of the following lengths: 3, 4, 5, 6, 7, and 8 inches; 4 coupling nuts; and 4 flange nuts. All items are packed in a sturdy plywood case. The studs can be furnished in thread sizes of ½-13, ⅝-11, ¾-10, ⅞-9, and 1-8.

Stock Stop

A stock stop primarily intended for Brown & Sharpe machines but which can also be used on any machine where a stock stop is indicated has been announced by the Balas Collet Mfg. Co., Dept. MM, 1557 E. 27th St., Cleveland 14, Ohio. The stop has a Carboloy face which, it is claimed, will not scuff or pick up material from the end of the bar, causing

Balas Stock Stop

variations in lengths or damage to the finished end of the piece.

The Balas Stock Stop can be inserted into the machine turret and includes a shank which is hardened to avoid nicking or scratching by the clamping mechanism. The stop is available in diameters of ⅝, ¾, and 1 inch, with each size furnished in two lengths.

Thread Forming Rotary Broach

The Shearcut Tool Co., Box 746 Reseda, Calif., has announced that its Shearcutter Thread Forming Rotary Broach heretofore available only in fractional sizes in U. S. Fine and Coarse thread types is now also being offered in sizes for forming machine screw size threads. The tool is designed to cut threads by virtue of end pressure exerted by the cutting edge rather than by radial pressure alone.

The Shearcutter Thread Forming Rotary Broach is said to produce accurately threaded holes; is practically unbreakable; requires a minimum of power; works equally well in most materials; does not bind or seize in the hole being threaded; does not tear the material being cut; has unusually long life; may be easily resharpened many times on a standard tool and cutter grinder; and feeds the chips out of the hole being threaded, thus preventing chip clogging and tool breakage. The broach may be used in tapping machines, automatics, turret lathes, engine lathes, or any machine adapted for a tapping operation. It can also be used for hand operation. The broach is interchangeable with standard taps and can be supplied to meet user requirements.

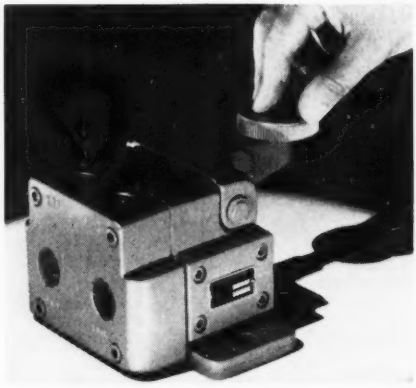
Shearcutter Machine Screw Size Thread Forming Rotary Broach

Right-hand spiral, right-hand cut are standard. Left-hand spiral, right-hand cut can be furnished on order.

Hand-Operated Air Valve

Introduction of a fast cycling type of hand-operated valve which provides four-way directional air control for the operation of single or double-acting pneumatic cylinders and other air-operated equipment has been announced by the Hannifin Corp., 1136 S. Kilbourn Ave., Chicago 24, Ill. Light pressure applied with the fingers, palm, or knee to

Hannifin Model NHS Hand-Operated Air Control Valve



depress the control knob $\frac{3}{8}$ inch is all the motion that is said to be required to operate the valve. Air line pressure, acting through a pilot control connected to the control knob lever, supplies the force to move the piston-operated main valve.

Designated as the Model NHS, the valve features a reciprocating, packless, self-lapping main valve disc. A light compression spring raises the control knob when the hand is removed. Ruggedly constructed for heavy duty industrial service, the valve is available in $\frac{1}{2}$ to $\frac{3}{4}$-inch sizes for use with air line pressure of from 25 to 150 lb. "In" and "out" air line connections are located in the top of the valve, with pipe connections to the air cylinder in the back. When it is desirable to provide remote control or simplify piping connections, the control knob can be located on the end of an extended rod connected to the operating lever.

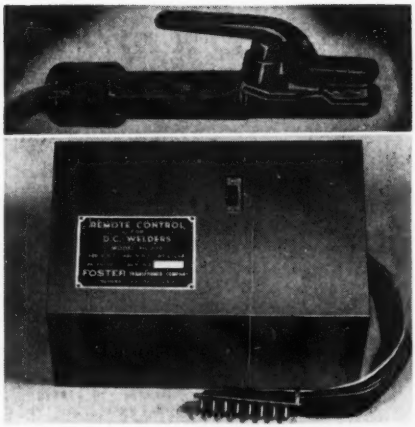
Remote Welding Control

A complete remote control for d.c. arc welding machines has been developed by the Foster Transformer Co., 3820 Colerain Ave., Cincinnati, Ohio. Designed to transfer all of the machine controls to the electrode holder, the unit consists of two parts; namely, a stainless steel control box for mounting on the welding machine and a standard electrode holder with special grip. With this equipment, the operator is not only able to start and stop the welding machine and select polarity but to also regulate the welding heat right at the holder. Connection between the holder controls and control box is effected by means of three No. 20 wires rope-spiraled in the cable along with the work cable. A special connector is provided to splice in additional lengths of cable.

The holder proper is a standard make and readily replaceable. Two control knobs are located at the back of the holder grip concentric with the cable.

One of the knobs actuates a double-throw switch. Depending upon which direction the switch is turned from the off position, the machine is started with either straight or reversed polarity. The other knob is calibrated for reference and is used to adjust the heat with smooth stepless control.

For straight polarity down-hand welding, the control is said to cover almost the entire heat range, with one setting of the machine, from maximum down. For reverse polarity requirements, the machine is set for the largest electrode size with the machine voltage control full on. The control, it is claimed, will then cover not only the rod size selected but the next two smaller rod sizes as well.



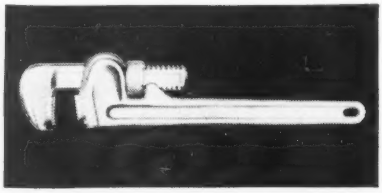
Foster Remote Control for D.C. Welders: (Above) Standard Electrode Holder with Special Grip; (Below) Stainless Steel Control Box

Aluminum Pipe Wrench

An aluminum pipe wrench which is fully drop forged from special high tensile aluminum alloy carefully heat treated for maximum strength and durability has been announced by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, New York.

Light in weight and designed to withstand abuse and severe usage, the wrench has a natural satin finish and includes replaceable alloy steel cadmium plated jaw inserts which are interchangeable.

The inserts each feature a multiple dovetail design and retaining screw for easy assembly and firm anchorage. The mov-



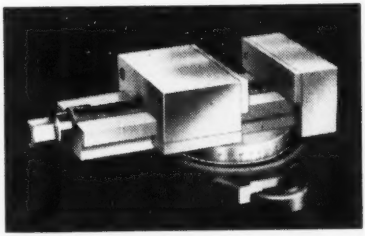
Williams Aluminum Pipe Wrench

able jaw is suspended between two springs in such a manner as to assure an immediate and positive gripping action. The steel adjusting nut of the wrench is case hardened, knurled for easy adjustment, and cadmium plated.

Small Machine Vise

A small swivel vise for holding work on shapers, milling machines, drill presses, and other machine tools has been announced by the South Bend Lathe Works, 386 E. Madison St., South Bend 22, Ind. The vise jaws have replaceable hardened steel inserts 4 inches wide x 1 inch deep. The maximum jaw opening is 4 inches.

The base of the vise is provided with two open slots spaced 7½ inches apart for bolting the vise to the machine table. The vise is arranged to swivel on the base and has 180 degrees of graduations reading from 0 to 90 degrees right or left. Positive swivel locking is provided for



South Bend Small Machine Vise

by two socket head screws and plug binders. A wrench is included for operating the vise.

Flexible Shaft Power Units

Known as the "Jiffy Tool" and the "Speed Jiffy," two flexible shaft power units which can be used for polishing, routing, brushing, grinding, buffing, drilling, filing, sanding, and various other operations have been developed by the Stow Mfg. Co., Binghamton, New York.

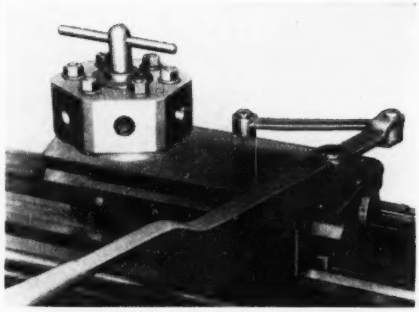
The Jiffy Tool is a 3-caster floor model, delivering ¼ h.p. at 1,750 r.p.m. through a 5-foot flexible shaft. The motor unit is designed for operation on 110 volts, 60-cycle single-phase a.c. Both ⅓ and ½ h.p. units can be supplied on order.

Stow "Jiffy Tool" (Above) and Stow "Speed Jiffy" (Below)

Designed for more complex operations, the Speed Jiffy has three speed variations of 1,000, 1,750, and 3,000 r.p.m. which are obtained by merely altering the plug-in position of the flexible drive shaft. The unit features an automatic tensioning belt which is said to eliminate the need for adjustments in the belt.

Hand Lever Bed Turret

The accompanying illustration shows the Enco Hand Lever Hexturret, product of the Enco Mfg. Co., Dept. 1129, 4524 Fullerton Ave., Chicago 39, Ill., which is available for all lathes from 9 to 12-inch swing and can be furnished with a 4¼ or



Enco Hand Lever Hexturret

6½ inch working travel. Features of the turret include hand scraped and spotted bearing surfaces, hardened indexing mechanism, and rigid topside clamping.

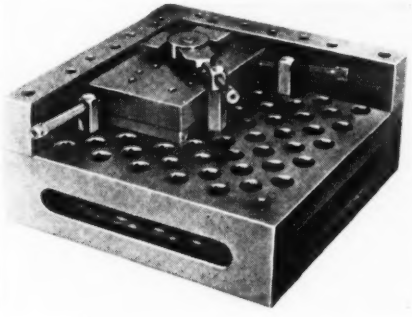
According to the manufacturer, the Enco Hand Lever Hexturret, due to its extreme accuracy, is particularly adaptable for close tolerance work in aluminum, brass, mild steel, and plastics.

Universal Drilling Plate

A universal drilling plate for use in the drilling and reaming of accurately spaced holes has been introduced by Montgomery & Co., Inc., 53 Park Place, New York 7, N. Y. The plate includes clamps which are designed to hold the work firmly against the two side rails of the unit. Gage blocks and a master drill disc are used to locate the position of the hole.

According to the manufacturer, the drill plate eliminates the necessity of re-

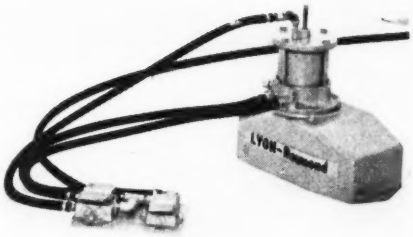
Montgomery Universal Drilling Plate



moving work in order to drill since all holes are located simply by using the proper accurate gage blocks. The master disc gage is made of tool steel and is hardened, ground, and lapped to 0.00006 inch. The disc gage hole is tapered for quick removal of the bushing.

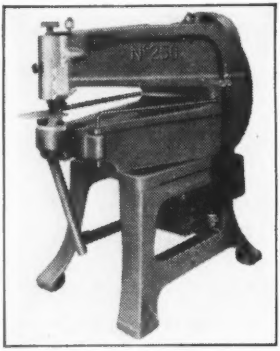
Hydraulic Pump

For operating material handling equipment of various types, the Lyon-Raymound Corp., 3952 Madison St., Greene, N. Y., has placed on the market an air-operated hydraulic pump which is available with several styles and sizes of oil reservoir. The pump is a single-acting air-operated unit in that it makes one stroke of its piston each time the valve, operated by a foot pedal, is opened. The release is operated by another foot pedal.



Lyon-Raymond Air-Operated Hydraulic Pump

NIBBLING . . The easy way to cut odd shapes from sheet stock



The Campbell Nibbling Machine operates by means of a rapidly moving circular punch over a circular die. The combination of punch and die takes a small "bite" with each stroke of the punch. The cut is made by holding the work against the pilot of the punch and following templet or scribed line. Since the punch and die are round, work can be fed equally well in any direction. The operator may use both hands in guiding the work, which makes it easy to cut intricate shapes.

The Campbell line of Nibbling Machines includes 7 models. Up to ½" steel may be nibbled in sheets up to 60" in width. On the Model 250, ¼" steel may be cut from sheets up to 72" wide.

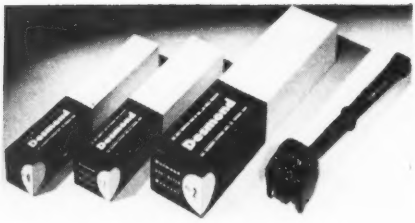
Source: CAMPBELL MACHINE DIVISION
American Chain & Cable
931 Connecticut Avenue
Bridgeport, Conn.

Power Hack Saw Blade

The "Red Rocket," a power hack saw blade, has been added to the line of metal cutting saws manufactured by the W. O. Barnes Co., Inc., 1297 Terminal Ave., Detroit 7, Mich. Highly recommended for production work, the blade is said to be capable of withstanding heavy feeding pressures because of its flexibility and toughness.

New Packages for Grinding Wheel Dressers

A pull-out type box of heavy weight cardboard designed for increased ruggedness and easy identification of Desmond



New Sturdier Packages for Desmond Grinding Wheel Dressers

grinding wheel dressers has been announced by The Desmond-Stephan Mfg. Co., Urbana, Ohio. Three sizes of boxes are to be used to accommodate the various sizes of Desmond-Huntington, Desmond-Hex, and Desmond-Sherman dressers. Large easy-to-read type printed on yellow boxes with half circles in which the size numbers of the dressers appear provide for quick product identification on shelves. Labels of different colors are used on the various boxes to distinguish different types of grinding wheel dressers.

Slip-Joint Pliers

Designated as the No. 550-8, a slip-joint pliers with offset pistol-grip handle that is designed to fit the natural hand grip and enable the user to reach hard-to-get-at jobs has been announced by the Utica Drop Forge & Tool Corp., Utica 4, N. Y. Normal pull on the handles of the pliers is said to tighten the grip on work and provide maximum holding power for wire twisting or pulling.

Made of drop forged alloy steel, the pliers, due to its pistol-grip feature, is

Utica No. 550-8 Pistol-Grip Slip-Joint Pliers

said to assure efficiency with minimum effort, reduce wrist fatigue, and prevent slipping and skinned knuckles.

New Books

How Salaried Employees Benefit from Job Evaluation. By R. M. Schmitz. Published by National Foremen's Institute, Inc., New London, Conn. 32 pages, 5½ x 8¼ inches. Illustrated. Paper bound. Price, 50 cents per copy, less in quantity.

Intended for use by companies which plan to install job evaluation or have such a program now in effect, this booklet, in four brief, clearly understood chapters, explains what job evaluation will and will not do for the employee. The author presents steps for setting up the program, covering every individual that comes under it. Finally, the major advantages of the job evaluation program are discussed.

Industrial Film Bibliography. Published by National Metal Trades Association, 122 S. Michigan Ave., Chicago 3, Ill. 100 pages. Price, $2.00.

Prepared under the direction of the N. M. T. A. committee on industrial training headed by C. H. Edgar of the Otis Elevator Company, this pamphlet lists 1,400 motion picture and slide film training aids and provides an up-to-date and complete revision of the bibliography and supplement released in 1947 and 1948 respectively. Offering pertinent information on audio-visual aids for supervisory and employee training programs, the bibliography lists both sound and silent films available for showing at employee meetings in the metal industry, as well as in industry in general. Each film is fully described as to contents, running time, availability, and whether black and white or colored, sound or silent. Several sources from which each film may be purchased, rented, or borrowed, as well as the sales or rental price charged, if any, are given.

New Shop Literature

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning MODERN MACHINE SHOP when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

"Our Story in Pictures" is the title of a 16-page two-color booklet issued by the American Non-Gran Bronze Co., 105 Lancaster Ave., Berwyn 5, Pa., which describes and fully illustrates the contract manufacturing facilities of the company for precision machine work, bronze castings, and Non-Gran bronze products.

Combination Decimal Equivalent Chart and 1950 Calendar is now being distributed by the Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn. The decimal equivalent chart is printed in two colors (black and red) and can be easily read at a given distance.

Mult-Au-Matic and Vertical Turret Lathe Tools and Tool Applications are fully illustrated in a 28-page booklet issued by The Bullard Co., Bridgeport 2, Connecticut.

Precision Levels. William B. Fell Co., 320 McLain Ave., Rockford, Ill., has available literature illustrating and describing its various "All-Way" Precision Levels for machine tool manufacture or maintenance.

Cutting Tools. Circular Tool Co., Inc., Providence 5, R. I., has published a Catalog "M" covering its entire line of circular metal cutting saws, combined center drills and countersinks, and reamers. The catalog illustrates saws ranging in diameter from ¼ to 10 inches in high speed steel and from ¼ to 6 inches in carbon steel. In addition, the Circle R line of solid carbide and carbide-tipped saws is presented. Also provided are a table of cutting speeds, speeds and feeds for high speed circular saws, millimeter conversion tables, table of decimal equivalents, and speed conversion table for carbide saws.

Venturi-Ball Valves are fully described in a 16-page two-color bulletin (No. 103) released by the Paul Valve Corp., 683 Third Ave., New York 17, N. Y. The well-illustrated catalog covers principle of operation and provides engineering data on the complete line which includes "whistle" valves, bar stock valves, cast steel and stainless steel valves, and forged valves.

Pyrometer Indicators with quick-coupling thermocouple connector panels for general industrial temperature measuring applications are illustrated and described in a four-page two-color catalog section (No. 25) issued by the Thermo Electric Co., Inc., Fair Lawn, N. J.

Narrow Face-to-Face Valves. A 12-page two-color catalog (No. 18) illustrating and describing a line of 50-lb. narrow face-to-face valves designed particularly for rugged hydraulic service is available from the R-S Products Corp., Wayne Junction, Philadelphia 44, Pennsylvania.

Soldering Products. A complete line of soldering products made by the P. Wall Mfg., 367 Erie St., Grove City, Pa., is illustrated and described in a 28-page catalog (No. 85) issued by this firm. Products covered include blow torches, soldering irons, solders, splicer's furnaces, compound kettles, and various other items.

Die Catalog Supplement. Containing details of improved features in standard round hole dies, Supplement D-3 to its general die catalog (D-126) has been issued by the Carboloy Co., Inc., 11143 E. 8 Mile Ave., Detroit 32, Mich. The supplement lists specifications and prices of dies R-1 through R-19 for drawing wire, bar, and tubing.

Powder Metallurgy is the subject of a four-page two-color bulletin (No. 149) published by American Sintered Alloys, Inc., 968 Farmington Ave., West Hartford, Conn., which explains clearly what powder metallurgy is and points out its wide range of applications. The bulletin is well illustrated with actual case studies.

Reamers and Reamer Grinding Fixture are fully illustrated and described in a 16-page catalog available from The Bullard Co., Bridgeport 2, Connecticut.

Dynamometers which are claimed to provide dependable test data on prime movers, including B.H.P., torque, efficiency, load, fuel, and life, are shown and described in a four-page two-color bulletin (No. 760) issued by the Taylor Dynamometer & Machine Co., 5108 W. Center St., Milwaukee 10, Wisconsin.

Machine and tool Accessories, including various sizes of hand knobs, handwheels, handles, jig and fixture components, and master shank holders, are listed as to specifications and prices in a 16-page illustrated catalog (No. 50) issued by George F. Bub & Son, 6015 Bradley Ave., Cleveland 9, Ohio.

"Material Handling—at the Machine" is the title of a 16-page booklet distributed by the Lyon-Raymond Corp., 20362 Madison St., Greene, N. Y., which shows how proper "positioning" of materials saves unnecessary handling during production operations. The booklet contains illustrations and descriptions of 12 different types of equipment of various manufacturers and includes two process charts as examples for determining the extent of handling operations from time of receipt of materials to shipment of finished product.

Air Valve. The Beckett - Harcum Co., 1140 Wayne Rd., Wilmington, Ohio, has published a six-page illustrated bulletin (No. 10) covering its "Hi - Cyclic" Air Valve. The bulletin contains data on the operation and construction features of the valve and complete descriptions, illustrations, and engineering drawings of various models, including the basic valve, dual exhaust or 5-port valves, single and double solenoid valves, piloted valves, and 4 - way hydraulic valves.

Unit Dust Collector. A four-page two-color bulletin (No. 20M) published by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati 25, Ohio, describes and illustrates the company's new Type "M" Unit Dust Collector which is available in capacities of 450, 900, and 1,800 c. f. m. at high velocity for handling dust from grinding, buffing, and polishing machines, as well as other dust sources.

Fluid Drives are features in a 28-page catalog and engineering data book (No. 2385) released by the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. Typical applications of the drives in connection with various types of conveyors, cranes, punch presses, screw feeders, and so on, are covered.

Dial Air Gage. A 16-page two-color catalog (No. DTP-491) issued by The Sheffield Corp., Dayton 1, Ohio, features the Sheffield Dial Type Precisionaire, a dial air gage for dimensional checking with extremely quick, dead-stop indicator action. The catalog illustrates and describes various models of the instrument and shows numerous typical applications.

Snagging Wheels. Mid-West Abrasive Co., Owosso, Mich., has issued a four-page three-color folder illustrating and describing its new "Fiber-Cushioned Snagging Wheels which are designed to absorb much of the shock and vibration resulting from snagging operations.

Disc Clutches with gear tooth and pin drives are covered as to construction features, operation, applications, installation, sizes, prices, horsepower ratings, and so on, in a 12-page bulletin (No. SF-5) available from The Edgemont Machine Co., Dayton, Ohio.

Electric-Eye Flame Cutting. A four-page two-color bulletin published by Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., illustrates and describes intricate and unusual steel shapes supplied by this firm cut to user specifications with Electric-Eye flame cutting equipment. Typical of some of the irregular shapes furnished include Diesel locomotive parts, sprockets, grinding wheels, boom bars, crankshafts, machine and equipment frames, and ornamental pieces.

Air and Hydraulic Devices. Announcement has been made by the Logansport Machine Co., Inc., Logansport, Ind., of the second printing of the pocket size booklet titled "The Facts of Life on Air and Hydraulic Devices." Compiled specifically as a service to tool engineers, designers, and maintenance men, the booklet presents in concise, matter-of-fact style the "Do's," "Don'ts," and "What To Look For" phases of setting up and servicing air and hydraulic valves; air, hydraulic, and air-draulic cylinders; hydraulic power units; lines, and power chucks.

Electric Blowers and Exhausters. An eight-page two-color bulletin (No. 3014-D) published by the Buffalo Forge Co., 388 Broadway, Buffalo 5, N. Y., illustrates and describes a line of electric blowers and exhausters for use in shops where air is required for oil or gas furnaces, for cupola work, gas boosting, or other services requiring constant air pressures up to 5,500 cubic feet per minute.

Centrifuges. Operating details, specifications, and application data on a complete line of Super-Centrifuges are provided in a 24-page bulletin (No. 1248) published by The Sharples Corp., 2341 Westmoreland St., Philadelphia 40, Pennsylvania.

Wire and Ribbon Stock Reels for use in connection with wire forming machines are illustrated and described in an eight-page two-color bulletin (No. 51) prepared by The A. H. Nilson Machine Co., Bridgeport, Connecticut.

Utility Cabinets and Stands. Bulletin SE-749 issued by Monarch Metal Products, Inc., 724 S. Columbus Ave., Mount Vernon, N. Y., illustrates and describes a line of utility cabinets and stands for factories, machine shops, toolrooms, shipping departments, and so on.

"An Entirely New Approach to Case Hardening" is the title of a 12-page folder issued by the Denfis Chemical Laboratories Inc., 172 Pacific St., Brooklyn 2, N. Y., which presents detailed examples, together with photographs, of the application and use of Carburit Pack-Hardening Paste and Isopac Isolating Paste.

"Faster Gear Production" is the title of a 20-page technical booklet prepared by the Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill., which presents a careful and thorough analysis of the advantages of Fast Index (multiple thread) hobs and the opportunities for exploiting the full production capacity of present gear-manufacturing equipment. Technical data on finishes, performance characteristics and comparative rates of production in various types of applications are provided.

Portable Electric Drill Kits. Portable Electric Tools, Inc., 320 W. 83rd St., Chicago 20, Ill., has issued a four-page two-color catalog presenting illustrations, descriptions, and prices of various models of portable electric drill kits for drilling, buffing, cleaning, polishing, sanding, tool grinding, and other operations.

Jig Borer with 36 x 72-inch rectangular table and designed to locate, bore, and check is described and illustrated in a four-page two-color circular released by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Connecticut.

Hardening Compound Report. An eight-page illustrated technical report (Bulletin No. 11) on treating carbon steel with an activated carbon-chromium hardening compound known as "Hi-Speed-It" is now available from the Wilson Carbon Co., Inc., 60 E. 42nd St., New York 17, New York.

Multiple Spindle Adjustable Drill Heads. Literature covering the specifications, features, and so on, of its various models of "Kwick-Change" multiple spindle adjustable drill heads is available from the Wisconsin Drill Head Co., Butler, Wisconsin.

Seven-Inch Bench Shaper is fully illustrated and described in a four-page two-color bulletin (No. 500) published by the South Bend Lathe Works, 427 E. Madison St., South Bend 22, Ind. The bulletin also describes and illustrates a three-drawer steel stand as well as motors and tools for the shaper. Prices of all items are listed.

Shape Cutting Machine designed to cut any desired shape within a 56 x 32-inch area in ferrous metal up to a thickness of 8 inches is described in detail and fully illustrated in a 12-page bulletin issued by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, New York.

Broaches. The Kase Machine Co., 18432 Buffalo Ave., Cleveland 19, Ohio, has available a multi-colored illustrated bulletin covering its complete line of "Glenny" push broaches and eccentric adapters. Designated as the No. 12, the bulletin provides operating and engineering data, specifications and prices.

Industrial Safety Equipment. A 64-page catalog illustrating and describing a line of eye and respiratory equipment for industry has been issued by Willson Products, Inc., Reading, Pa. The catalog includes considerable technical and reference material to help the user select the proper type and style of equipment for the specific occupational hazard involved and to provide him with information on its use and care.

Drill Jigs. Literature on "Johns" Drill Jigs equipped with universal jaws for use in second operations such as drilling, tapping, threading, chamfering, end milling, and so on, is now available from the Heuser Mfg. Co., 1638 N. Paulina St., Chicago 22, Illinois.

Flexible Shafting. Elliott Mfg. Co., 95 Prospect Ave., Binghamton, N. Y., has prepared a four-page circular (No. 4a) illustrating and describing a line of flexible shafts, unit drives, attachments, and push-pull controls designed to provide an economical and practical means of transmitting power to out-of-the-way places.

Jobbing Work. Hardinge Mfg. Co., 240 Arch St., York, Pa., has issued a 12-page illustrated bulletin (No. AS-400) describing in detail its facilities for pattern and casting production, machine work, plate steel work, and the manufacture of custom-built machinery.

Silent Chain Drives. A catalog (No. SCS-49) announced by the Whitney Chain & Mfg. Co., Hartford 2, Conn., is designed to facilitate the selection of silent chain and chain drives. Covered are chain drives for applications falling within a range of fractional horsepower to well over 50 horsepower.

Charts for Optical Comparators. A 20-page two-color catalog of charts for J & L optical comparators has been published by the Optical Comparator Division, Jones & Lamson Machine Co., Springfield, Vt. Included are data on radius charts, grid charts, protractor charts, screw thread charts, standard inspection charts, chart rails, glass scales, blank drawing charts, combination holders for charts and photographic film, and optical comparators.

Engineering and Production Equipment. Continental Industrial Engineers, Inc., 176 W. Adams St., Chicago 3, Ill., has issued a 12-page two-color booklet (No. 127) discussing in detail the broad scope of its services to industry. Included are many illustrations with detail descriptions of a wide variety of production lines and automatic processing equipment covering practically every industry.

Variable Speed Transmission. Revco Inc., 405 Thorpe Bldg., Minneapolis 2, Minn., has issued a four-page two-color bulletin (No. 149) illustrating and describing in detail its "Zero-Max" Transmission with infinite speed variation from zero to maximum.

Inert-Gas Shielded-Arc Welding Process designated as "Heliwelding" and said to provide for the easy joining of hard-to-weld metals is discussed in a 16-page illustrated catalog (No. 9) published by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, New York.

Specialized Lubricants for industrial and automotive machinery are described in a 30-page application guide (Form C1OL) distributed by the Keystone Lubricating Co., 21st & Lippincott Sts., Philadelphia 32, Pa. Included are recommendations for lubricating all types of bearings under various operating conditions. Also provided is information covering the lubrication of power generation, transmission and materials handling equipment, as well as special recommendations covering the lubrication of pump glands, valves, and other equipment subjected to contact with acids, alkalies, and moisture.

Gears. Oliver Gear & Machine Co., Inc., 1114 Niagara St., Buffalo 13, N. Y., has available a 32-page pocket-size booklet illustrating and describing a complete line of gears, including cut spur gears, cut bevel gears, cut miter gears, cut worm gears and worms, spiral gears, cut sprocket wheels, finished machine racks, cut internal gears, molded tooth gears, stub tooth gears, rawhide gears, and Micarta gears. Tables presenting information on gear prices, dimensions, and so on, as well as tables of decimal equivalents, dimensions of standard key seats for gears, and weight of round steel per inch of length, are also provided.

All Electric Unit Heaters for industry are covered as to specifications, features, typical installations, and so on, in an eight-page two-color catalog (No. EC-62) released by the Electromode Corp., 45 Crouch St., Rochester 3, New York.

Steel Hardening Compound, an activated carbon-chromium steel catalyst marketed under the designation "Hi-Speed-It" is fully described in an eight-page two-color illustrated folder issued by the Wilson Carbon Co., Inc., 60 E. 42nd St., New York 17, N. Y. Also issued is an eight-page folder giving instructions for the successful use of the compound.

Machine Tools, Spacers, and Conveyors. The Bullard Co., Bridgeport 2, Conn., has released a 12-page three-color bulletin illustrating and describing its "Cut Master" vertical turret lathes, Man-Au-Trol vertical turret lathes, Man-Au-Trol horizontal lathe, Mult-Au-Matics, Bullard-Dunn conveyors and process, and Bullard-Universal boring, drilling and milling machines.

Open Back Inclinable Presses ranging from 90 to 250 tons in capacity are covered as to design features and specifications in a six-page two-color illustrated bulletin (No. OBI-49) issued by the Verson Allsteel Press Co., 9130 Kenwood Ave., Chicago 19, Illinois.

Air and Hydraulic Cylinders. The Hydro-Line Mfg. Co., 711 19th St., Rockford, Ill., has available a 32-page catalog containing complete engineering data on hydraulic cylinders (both high and low pressure) and air cylinders for operating pressures to 1,500 pounds per square inch.

Thread Milling Machine. The James Coulter Machine Co., Bridgeport, Conn., has issued a catalog which explains in detail the mechanics, specifications, and so on, of its "Threadmaster" Thread Milling Machine for the cutting of precision threads on a production basis.

Universal Ram-Type Hydraulic Broaching Machines designed for both internal and surface broaching, as well as press work, are fully covered in a four-page technical bulletin (No. RP-49) available from the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Michigan.

Twist Drill Price List. As a convenience to the manufacturer as well as the distributor, the Union Twist Drill Co., Athol, Mass., has released a 12-page net consumer price list on taper and straight shank twist drills, combined drills and countersinks, prentice drills, coes drills, bit stock drills, and ratchet drills.

Turbine Oils. The problems of oxidation, emulsification, foaming, and sludging as related to turbine lubrication are discussed in a four-page illustrated folder on "Turbo-Drive", a fortified turbine oil, issued by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pennsylvania.

Hydraulic Tubing. Bulletin 38 issued by the Superior Tube Co., 2101 Germantown Ave., Norristown, Pa., provides general and technical information, as well as specifications, on a line of seamless steel hydraulic tubing from ⅛ to 1⅛ inches outside diameter.

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Two-Dimensional Engraver. A bulletin released by the H. P. Preis Engraving Machine Co., 657 Route 29, Hillside 5, N. J., illustrates and describes the Model 2D-4 Panto-Engraver for general two-dimensional engraving on name plates, large panels and signs, steel dies, steel stamps, and other objects requiring precision or production machine engraving or profiling.

Abrasive Rolled Steel Floor Plate, particularly recommended for industrial floors, loading platforms and ramps, walkways, building entrances, and trench and hatch covers, is described and illustrated in an eight-page two-color booklet prepared by the Alan Wood Steel Co., Dept. W-76, Conshocken, Pennsylvania.

Face Grinder. Recommended for practically every face grinding application where flat, square surfaces are required, a face grinder with motorized spindle and 18-inch wheel is illustrated and fully described in a four-page two-color bulletin published by the Abrasive Machine Tool Co., East Providence 14, Rhode Island.

Directory of Welding Alloys. The Eutectic Welding Alloys Corp., Dept. P, 40 Worth St., New York 13, N. Y., is distributing a 1950 Directory of its various low temperature welding alloys, including rods for cast iron welding, aluminum welding, die-cast welding, cutting, steel welding, stainless steel welding, brass, bronze and copper welding, overlay jobs, and so on.

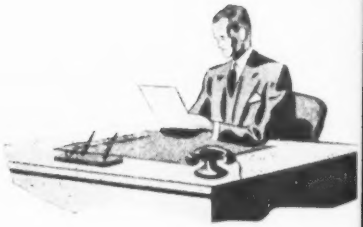
Heat Processing Machines for forging and bending are discussed as to design and characteristics in an eight-page two-color bulletin issued by the Selas Corporation of America, Erie Ave & D St., Philadelphia 34, Pa.

Speed Reducers. Euclid Universal Machine, Inc., 15002 Woodworth Rd., Cleveland 10, Ohio, has prepared a 28-page catalog containing descriptions, illustrations, dimensions, and specifications of a complete line of speed reducers, including single and double reduction types. Illustrations and descriptions of special types of speed reducers are presented.

Air Control Valves. A four-page two-color folder now being distributed by the Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, illustrates and describes a line of air control valves for various requirements, including knob-operated, lever-operated, cam-operated, clevis-operated, foot-operated, treadle-operated, single and double-cylinder operated, and single and double-diaphragm-operated types.

General Purpose High Speed Steel known as "Unicut" is the subject of a four-page two-color brochure published by the Universal-Cyclops Steel Corp., Dept. MS, Bridgeville, Pa. The brochure provides a chemical analysis, heat treatment data, and hardening and tempering curve on Unicut, as well as information on the wide range of applications for which the steel is suited.

WHERE TO GET IT



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are businessmen

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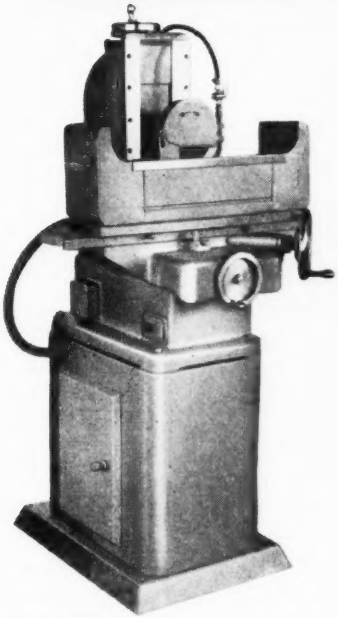

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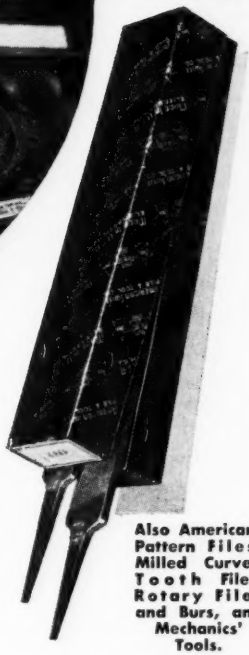

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Over the Editor's Desk

Will Democracy Pull Down Its Own Temple?

IT is an ironic fact that the fruit of Democracy carries within it the seeds of its own ruin, and the pages of history bear testimony to more than one case where the fruit has been destroyed in the effort to get at the seeds. A prominent educator points out that twenty civilizations before our own have "strutted to their doom as their governments tried to do everything for everybody while the people were lulled into listlessness and apathy." As 1950 dawns it finds America following the same course that led these other nations to their doom. Will we come to our national senses in time, or must we—like Samson—pull the Temple down upon our own heads?

In the last ten years the dollar has lost 50% of its value. In other words, it will buy only half as much as it bought in 1939. In those ten years the price index for all commodities has jumped up 104.5%; for farm products it is up 171.8%; building materials have risen 112%, and most industrial equipment and consumer goods have risen in price on a comparable basis. The country is staggering under a national debt of $256 billion, and the Administration is asking for more money in order to set up more projects "for the people," which will force the Federal liability even higher.

Too many people overlook the fact that the Federal Government has no money of its own; all the money it has is what it takes from the American people. And too many people are entirely unaware of the fact that the present high cost of living is due in large measure to the taxes they pay whenever they make a purchase. Of the 20 cents paid for a package of cigarettes, 9 cents goes into the tax till. Of the 26 cents (or thereabouts) paid for a gallon of gasoline, 6½ cents goes for taxes. There are more than 100 "hidden" taxes in the price of a suit of clothes—and there are hidden taxes in the prices of all other commodities. If the cost of government could be lowered, the cost of living could also be lowered—provided the government didn't force the payment of tribute for other services.

However, the Administration is leading the parade in the push for an enlarged welfare program. Demands are being made for health insurance and unemployment pay, life insurance, disability, severance and vacation pay, reduction in the hours worked, and so on. A survey made by the Economic Research Department of the Chamber of Commerce of the United States, covering 203 large and medium-sized companies, showed that hidden payroll costs—pensions, social security, vacations, holidays, and so on—average 20.5 cents per hour worked and cost $424 a year per worker. The aggregate cost of these fringe benefits amounts to 15.4 per cent of the total wage bill of the reporting companies. All of it comes out of the pockets of the ultimate consumers, and still we wonder why living costs are so high.

Now the Administration, through its so-called steel "fact-finding board," has set a precedent for nation-wide pension plans, with the implication that the costs should be borne by the employers. In studying the effects of such a program upon living costs, the first point to be remembered is that the cost of such pensions must be added to the cost of the product and must therefore be paid by the buyers of the product, who in turn will pass it on to the buyers of *their* products, who in turn will pass it on—and

so on indefinitely until every consumer has made his contribution to the cost of that pension. No one escapes; even the buyer of groceries will pay a little extra to pay for the steel cash register, purchased by the grocer who must pay a little extra to the cash register manufacturer who buys steel, who must pay a little extra to the steel manufacturer so that he can meet the costs of pensions for his union workers.

If all the unions obtain similar pensions for their members, all of the costs of these pensions will—in the end—be paid for by the public, and the costs of living will mount accordingly. Thus this form of social security will degenerate into a scheme of special privilege for a powerful group that in the aggregate constitutes only about one-fourth of the labor force, which means that the protection of the other three-fourths will be placed in jeopardy. And this three-fourths will pay the taxes necessary to meet the costs of the pensions for the one-fourth.

To be fair to all, the unions' demands for $100 a month pensions should be applied to all who are the age of sixty-five or over in this country, or about 10 million persons. The cost for this program would be $12 billion a year at the present time, but it is estimated that by 1960 there will be 18 million persons in this country sixty-five years of age or older, for whom the cost of $100-a-month pensions would amount to $21.6 billions a year.

The economists of the First National Bank of Boston point out that we are building up a system of security that penalizes the younger generation, due to the fact that an increasing proportion of income will be required to provide for the growing number of non-productive workers. They further warn that "the organized pressure for pensions can become a ghoulish nightmare that saps the vitality of the younger generation."

It is high time that the union member pause in his efforts to gouge the other fellow and give some thought to the end results of his thinking. In the first place, the policy of forcing an employer to pay for pensions and other benefits, when he knows that not the employers, but other citizens, will have to pay the bill, is unfair and therefore dishonest. If it is his attitude that others have the same right, and all other people proceed to do the same thing, everyone will be paying for his own benefits and the costs of administration will be so high that we will find ourselves in the same condition as the nations across the ocean—nations to whom the American people are now sending money and food and clothing.

After some years of experimenting with a "welfare state" the people of Australia and New Zealand have seen the light and have thrown out the Socialist government. If the American people are as smart as their brothers across the seas, they will assume the responsibility for their own welfare and head off the impending catastrophe before it gathers any more force.

Howard Campbell

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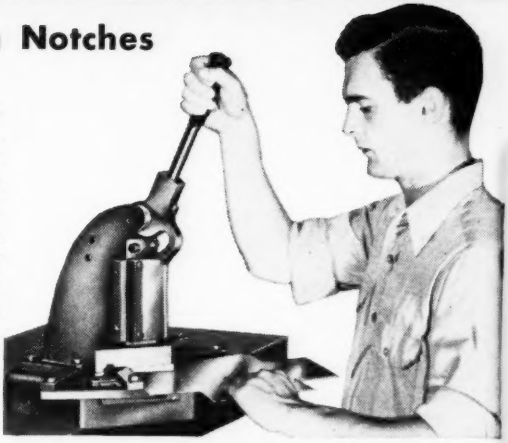

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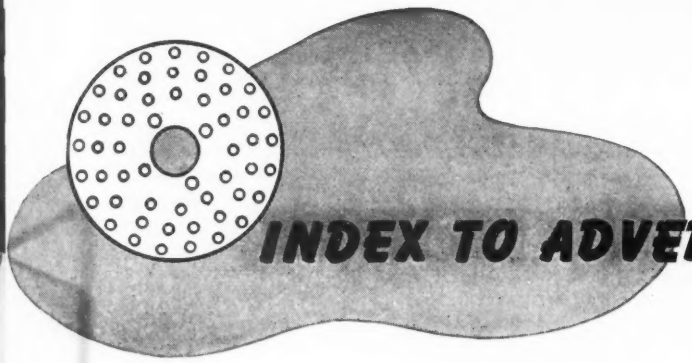

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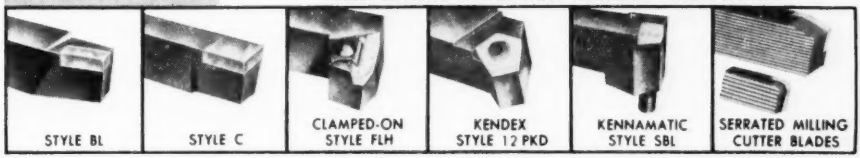

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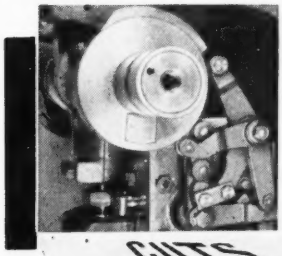

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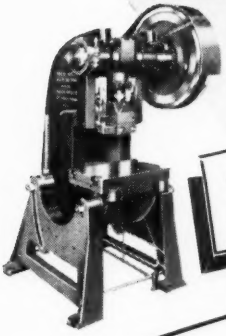

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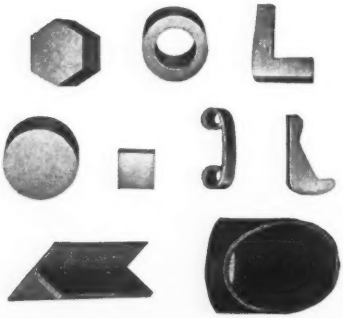

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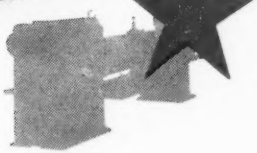

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Spindle speeds, range, rpm	25-1250	25-1250	16-1010	9-800
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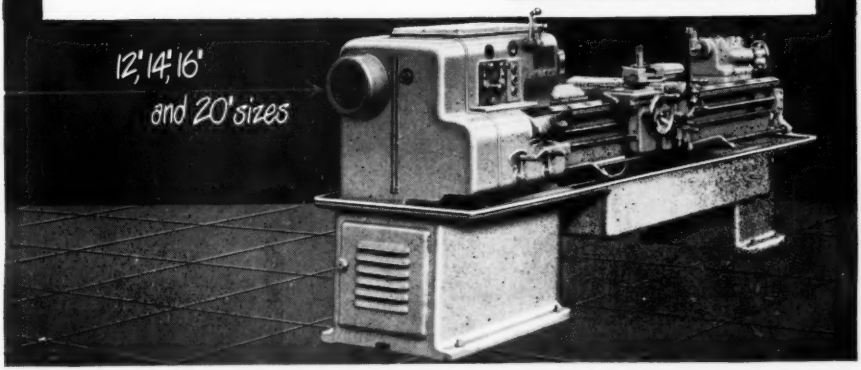

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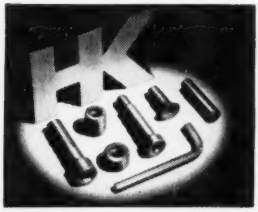

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